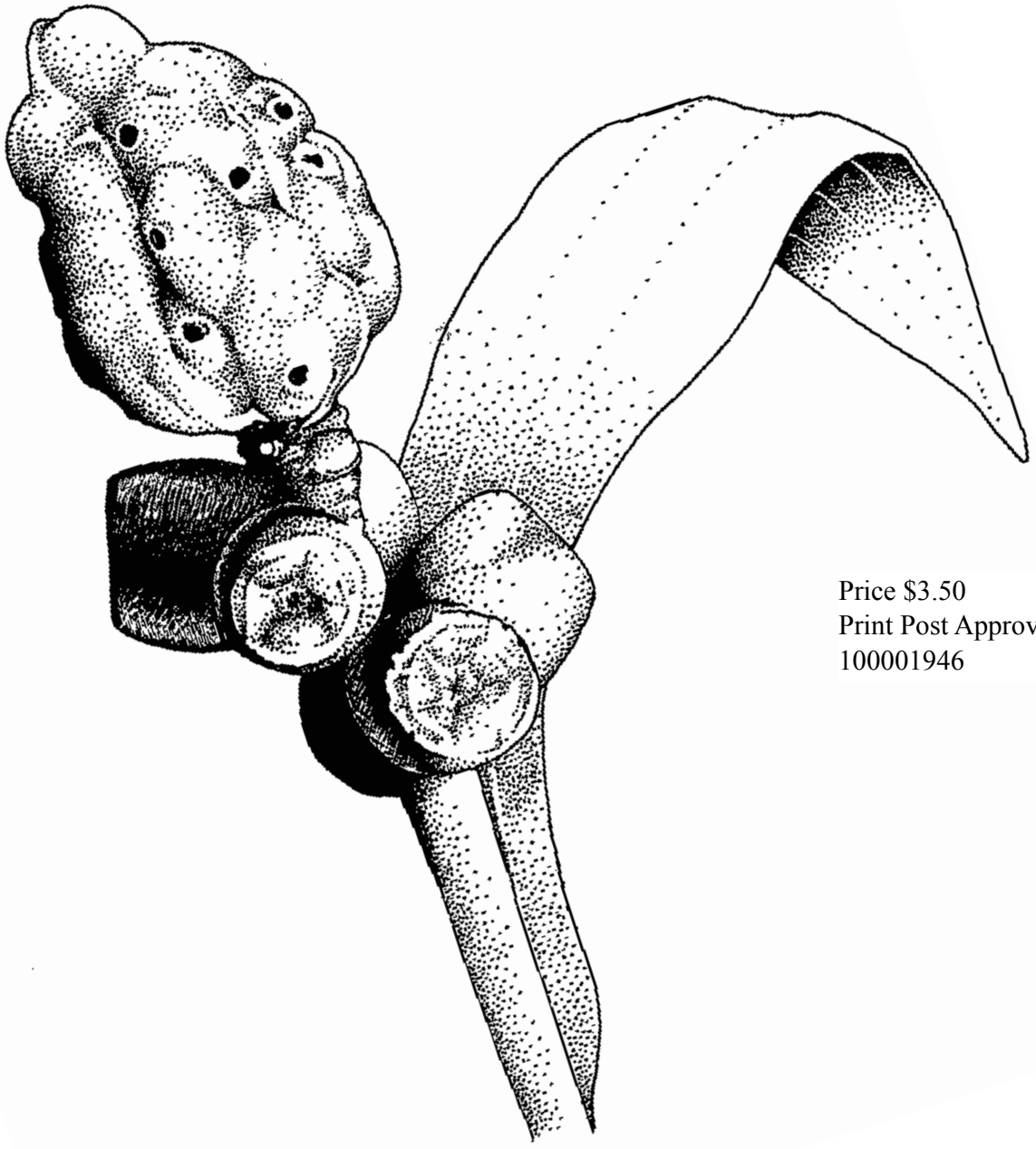
Entomological Society of Queensland

NEWS BULLETIN



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Entomological Society of Queensland

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Front Cover Illustration: This beautiful illustration is by Andrew Moore when he was employed with the Australian Biological Control Laboratory at Townsville, James Cook University. The Fergusoninidae gall fly, *Fergusonina turneri*, forms galls on the broad-leaved paperbark tree *Melaleuca quinquenervia* in a symbiotic relationship with *Fergusobia quinquenerviae* nematodes. The galls, located at the top of the stem, show adult fly exit holes. Although this insect was highly specific, it failed to establish after being released in Florida as a biological control agent.

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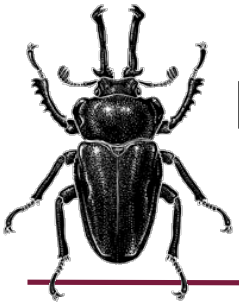

Entomological Society of Queensland

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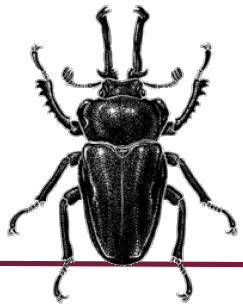
The **ENTOMOLOGICAL SOCIETY OF QUEENSLAND**, since its inception in 1923, has striven to promote the development of pure and applied entomological research in Australia, particularly in Queensland. The Society promotes liaison among entomologists through regular meetings and the distribution of a *News 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. Emblem illustration by Sybil Curtis.



Entomological Society of Queensland
Minutes for General Meeting

Tuesday, August 9th, 2016
Held in the Seminar Room, Ecosciences Precinct, Boggo Rd, Dutton Park.

Meeting open: 13:00

Attendance (31): Bronwen Cribb, Mizuki Uemura, Weng Chow, Steve Frances, Tim Heard, Angus McEwan, Helen Nahrung, Andrew Hayes, Mark Schutze, Perry Bennion, Andrew Maynard, Justin Cappadonna, Mona Morandi, Andrew Hulthen, Andy Wang, Luke Bennett, Graham Forbes, David Holdom, Noel Starick, Don Sands, Chris Lambkin, Susan House, Tara Wheatland, Lance Maddock, Gary Cochrane, Julianne Farrell, Nadine Baldwin, Cate Paull, Brad Brown, Geoff Monteith, Kathy Ebert.

Visitors (7): Lisa Fenech, Ryan Fenech, Jack Fenech, Felicity McIntosh, Jillian Templeton, Suzy Perry, Giorgio Venturieri

Apologies: Ross Kendall, John Lawrence, Lyn Cook, Cabell McKee, Greg Shannon, Penny Mills, Desley Tree, Geoff Thompson

Minutes: The minutes of the last meeting were circulated in News Bulletin 44[4] June/July 2016. Moved the minutes be accepted as a true record: Cate Paull, Seconded: Geoff Monteith, Carried: All.

Nominations for membership approved by council:

General: Roger Farrow, Diwan, QLD
Adam Slipinski, Canberra, ACT

Students:
Ingrid Shiel (QUT)
Marisa Stone (Griffith University)

General Business:

1. Council passed two motions in the August Council Meeting:
    a. The establishment of social media accounts, specifically Twitter and Facebook, for the Entomological Society of Queensland. These will be developed by Tim Heard (Vice President) and Cate Paull (Councillor), with more news to follow.
    b. The establishment of a Small Grants Scheme that will award up to $2000 annually for an entomological project, with nominations soon to be welcome from ESQ members. The first grant will be given in 2017, with project proposals due by March of 2017. More details to follow.
2. Christine Lambkin noted that new Parks had been added to the ESQ permit, and encouraged members to contact her for further details as required. The new list is also published on our website. Christine is also ready and willing to pass Permit Officer responsibilities to another person, and has requested that anyone interested get in touch with her – a great way to serve the Society and provide assistance in a key role!

Main Business:
Presentation by Julianne Farrell on "*Processionary caterpillars: their ecology and relationship to equine foal deaths*".

Mark Schutze gave a vote of thanks at the end of Julianne's fascinating, and richly varied, presentation.

Next meeting: The next meeting will be on the 13th of September, presented by Kumaran Nagalingam on "*Functional role of male lures of* Bactrocera *fruit flies: potential to maximize their use in pest management*"

Meeting closed: 13:47

Bactrocera fruit fly. Photo: Jaye Newman

At our next meeting...

"Functional role of male lures of *Bactrocera* fruit flies: potential to maximise their use in pest management"

presented by Dr Kumaran Nagalingam
Science and Engineering Faculty,
Earth, Environmental and Biological Sciences
Queensland University of Technology

Males of *Bactrocera* fruit flies show strong, positive olfactory and gustatory responses to plant-derived chemicals: the most common compounds are methyl eugenol, raspberry ketone (and its synthetic analogue cuelure) or zingerone. These compounds, commonly known as male lures, are used in monitoring and control of *Bactrocera* fruit flies through a lure-and-kill approach when mixed with insecticides. Males that have fed on the lures commonly have a mating advantage over males that have not fed on lures, positively shown to be a result of releasing more attractive pheromone volatiles and being subsequently selected by females for copulation. In addition, male lures raspberry ketone and zingerone, known to increase energy metabolism in a diverse range of organisms, act similarly in *Bactrocera* flies and demonstrate additional benefits to males as lure feeding may increase a fly's short term energy. The above effects are not just current generational: offspring sired by lure-fed males show greater foraging ability to lures, which strongly implies indirect epigenetic effects. These scenarios suggest feeding on male lures leads to complex behavioural and physiological changes that can be utilized to maximise their use in management of *Bactrocera* fruit flies.

About our speaker...

Kumaran Nagalingam is an entomologist/ ecologist at QUT with a strong interest to advance the basic understanding of behaviour of economically significant arthropods to assist in pest management. His research areas include understanding mechanisms mediating complex behaviours using direct observational and indirect genetic changes in economically important insect pests.

Tuesday, August 9th at 1pm, Seminar Room at EcoSciences, afternoon tea following. All welcome!

The ecology and management of processionary caterpillars: a primary agent of equine abortions

presented by Julianne Farrell

PhD Student
School of Biological Sciences
University of Queensland

Processionary caterpillars, *Ochrogaster lunifer* Herrich-Schäffer, 1855 (Fig. 1) are a native, univoltine species that are found in most regions of Australia. Their preferred diet is the foliage of certain acacia and eucalyptus species, although other trees such as casuarinas, grevilleas and maples have been recorded as host species. The urticating setae attached to cast skins of the caterpillars have been associated with Equine Amnionitis and Foetal Loss (EAFL). Research into caterpillar ecology and management strategies is being funded by Hunter Valley Thoroughbred studs and the Hunter Valley Equine Research Centre through the ARC.

Figure 1. Fifth instar caterpillars on the trunk of an *Acacia* sp. Image: Julianne Farrell

Caterpillar Ecology

In eastern Australia, moths begin emerging from November to mate and lay eggs. The female moth lays her eggs in a clump on a branch, on the trunk, or at the base of a host tree and covers them with scales and fibres from a tuft on her abdomen. This may be to protect the eggs and non-feeding first instars from predation and dehydration. Egg masses that appear on branches are invariably a golden orange colour (Fig. 2), while those egg masses that appear at the base of trunks are invariably white in colour with a much more loose, fluffy texture (Fig. 3). Egg masses deposited higher on trunks are often white. The moths are non-feeding and only live for several days. These morphological differences in egg masses are one indication that the caterpillars may be part of a species complex rather than a single species.

As the caterpillars begin to feed from 2nd instar stage onwards, they build a nest on the site where the eggs were laid. These will be described as canopy (Fig. 4), ground or trunk nests (Fig. 5), and mature

Figure 2. Egg mass of the canopy-nesting form of *O. lunifer*. Image: Julianne Farrell

Figure 3. Egg mass of the ground-nesting form of *O. lunifer*. Image: Julianne Farrell

nests generally range between softball to soccer ball size, depending on the number of resident caterpillars. Egg masses placed close to each other will often coalesce into one large nest. It is possible that the different nesting forms are different species of *Ochrogaster*. We hope to clarify the taxonomic relationships between the nesting forms using DNA and cuticular hydrocarbon analyses. The author has received a UQ Postgraduate Travel Award to undertake training in cuticular hydrocarbon analysis at Keele University, UK.

In the egg and early instar stages of development, nest mortality is high, with >50% failing to establish for reasons including predation, parasitism and early instars becoming lost during feeding in the canopy. In surviving ground nests, caterpillars develop through 8 instars, with mass skin shedding inside the nest. The number of instars in canopy and trunk nesting forms is yet to be clarified. Nest development continues throughout summer and the caterpillars remain in the same tree unless it becomes completely defoliated. The caterpillars will then abandon nest and tree and leave in search of another host tree. The nest in Figure 5 had been recently abandoned due to defoliation. No new nests

Figure 4. Large canopy nest on *Acacia* sp. near Pittsworth. Caterpillars had defoliated the tree after 4 months feeding. Image: Julianne Farrell

Figure 5. Large trunk nest on a eucalyptus in NSW. Image: Julianne Farrell

appeared in surrounding trees, so these caterpillars probably became lost and died.

Around April / May each year, the final instar caterpillars cease feeding and form a procession to leave their tree in search of a suitable diapause and pupation site, usually in the top layers of soil or vegetation debris within about 200m of their host tree. The procession breaks up as they travel with small numbers and eventually single caterpillars travelling in different directions. The caterpillars spend most of winter in diapause, then pupate approximately 6 weeks prior to emergence as an adult moth. Once the nests have been abandoned and are no longer maintained by the caterpillars, they begin to break down, spreading the cast skins with attached urticating setae into the surrounding environment, and being spread further by wind currents.

Caterpillar – Pregnant mare interactions

The link between equine abortions and foal deaths and the presence of hairy caterpillars with urticating setae was made in Kentucky in the US in 2000 when Thoroughbred studs suffered an 'abortion storm'. The link between mare abortions and processionary caterpillars in the Hunter Valley was made in 2004 by UQ researchers when several studs had unexplained foal losses. The theory was proven by vets Judy Cawdell-Smith and Kristen Todhunter during their PhD research into the emerging problem.

It is not so much the live caterpillars, but the approximately 4 million microscopic urticating setae that each caterpillar produces during its' lifetime that are the problem for pregnant mares, which ingest the cast skins and hairs while grazing contaminated pastures (Fig. 6).

In early research conducted by Judy Cawdell-Smith, it was found that mares fed caterpillar skins and setae for 5 days during pregnancy aborted their foetuses, or gave birth to under developed live foals. Typical results are shown in Fig. 7, where the mare of the larger foal was not exposed to caterpillar

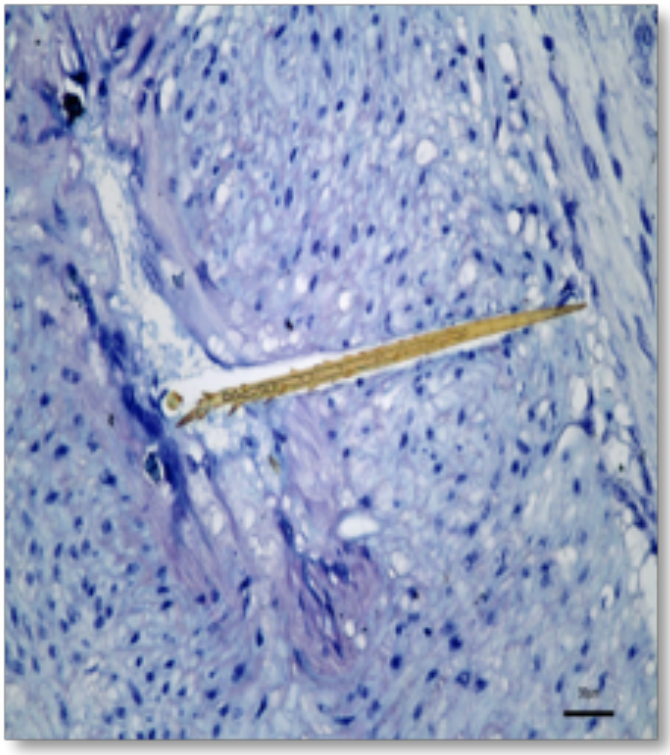


Figure 6. *Ochrogaster* seta in an artery of the small intestine of a mare with aborted foal. Image: Kristen Todhunter

Figure 7. Two foals on the day of their birth. The larger foal weighed approx. 45kg and the smaller foal weighed approx. 24kg. Image: Judy Cawdell-Smith

material during pregnancy. The mare of the smaller foal ate caterpillar material for 5 days during her pregnancy.

Other problems caused by ingestion of caterpillar material by pregnant mares are shown below. The foal in Fig. 8 was born 5 weeks preterm and weighing 17kg, to a mare who ate caterpillar material for 5 days during early pregnancy. The foal had major deformities in all four limbs and was later euthanized. The placenta belonging to the foal is seen in Fig. 9, and shows the focal mucoid placentitis (pale area indicating reduced blood supply to the foetus) associated with EAFL. Ingestion of caterpillar material is an initiating factor, with bacterial infection following migration of the setae from the gastrointestinal tract into the uterus and placental tissues.

Figure 8. A foal born 5 weeks preterm and weighing 17kg, to a mare who ate caterpillar material during early pregnancy. Image: Judy Cawdell-Smith

Management options

- Acquisition of a caterpillar detector dog. The proposal was well received by participating Hunter Valley studs at a recent meeting. The project has had several setbacks, but we could have a dog trained and working by July 2017. The idea is for the dog to find diapausing caterpillars and pupae in affected paddocks for physical removal, thus reducing the number of adults that subsequently emerge on each participating stud. Animal ethics approval has been applied for through the UQ Ethics Committee.

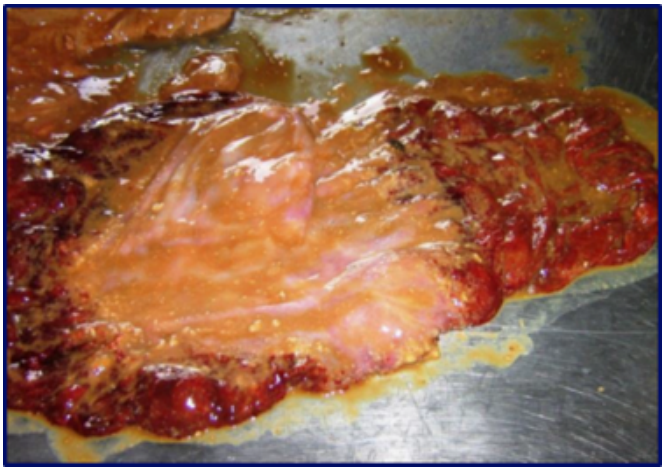


Figure 9. The placenta belonging to the foal in Fig. 8 showing pale coloured focal mucoid placentitis associated with EAFL. The pale area indicates poor blood flow to the placenta. Image: Judy Cawdell-Smith

- Physical removal & destruction of nests before departure of the caterpillars. Many studs have begun including this option as routine paddock management between December and May each year. The author has begun running caterpillar identification workshops to show stud staff what to look for and remove.

- Removal of known host trees and replacement with non-host species. Some studs have removed host trees in mare paddocks and replaced with other species. The list of known host species is slowly growing as we have infested trees identified. This list will be made available to studs, Landcare groups and plant nurseries during the project.

- Continued investigation of predators and parasitoids, e.g.. dermestid beetles, tachinid

flies and pyralid moths. Continued search for potential biocontrol agents.

Acknowledgements

My supervisors Meron Zalucki, Bronwen Cribb, Judy Cawdell-Smith and Lynda Perkins and the ARC Linkage caterpillar project team; collaborating studs in the Hunter Valley; Catherine Chicken, Cameron Collins & Joan Carrick, the Hunter Valley Equine Research Centre, and the Hunter Thoroughbred Breeders Association.

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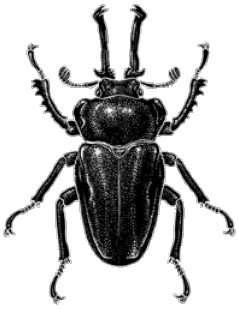
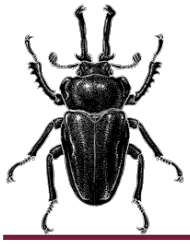


Springbrook BugCatch weekend: November 19-20

This is a reminder that the next ESQ BugCatch will be on the weekend of November 19-20 to the Springbrook Plateau. Springbrook is a high wet tableland lying between Lamington and the Gold Coast and is about 90 minutes drive from Brisbane on good roads. We will be guests of the Australian Rainforest Conservation Society and our basecamp will on their extensive wilderness property called Ankida which has several hundred hectares of rainforest with running creeks and waterfalls. We will have the use of a vacant house with showers, kitchen and lots of good camping areas right beside. Mains power is available at several spots for running light traps. Kathy Ebert and Geoff Monteith will be leading the camp with the help of Aila Keto and Keith Scott of the ARCS. Kathy and Geoff will be running a dung beetle survey with participation from local residents and ESQ members are welcome to help with that. Full details will be in the next News Bulletin.



Research Feature

This month's research feature presents two honours students' projects from The University of Queensland and James Cook University.

Shelter from the storm – do flower thrips avoid hazardous weather and seek refuge in a suitable flower?

--Lachlan Jones, recent Honours student
University of Queensland

For an animal to survive in nature, it must both find sufficient food to remain alive and mitigate the dangers of its environmental surroundings. For herbivorous insects, overcoming these challenges typically involves the ability to find and recognise a suitable food plant, and avoid exposure to wind and rain, thought to be particularly hazardous to insects because of their small size. Indeed my study species, the common blossom thrips (*Frankliniella schultzei*), is only about 1.5 mm long, considerably smaller than a typical raindrop. These thrips are known to fly between plants during daylight hours in search of a mate or a new flower to feed on, and so are potentially exposed to changing weather conditions.

This insect has been found in many different flower species, but one flower in particular, *Malvaviscus arboreus,* a relative of *Hibiscus* with tubular shaped red flowers, tends to support the largest populations of blossom thrips, in the Brisbane area. My research focused on thrips found in *Malvaviscus* and *Hibiscus* flowers, addressing two broad questions about these thrips: what sensory cues do they use to recognise *Malvaviscus* flowers and what action (if any) do they take to avoid unfavourable weather conditions?

To address the first of these aims, I compared attraction of thrips in the field to *Malvaviscus* flowers, the major host, and *Hibiscus* flowers, a minor host. On each field day, I placed *Hibiscus* and *Malvaviscus* flowers on poles around bushes of both species, left them there for 5 hours, then sampled the flowers in ethanol and counted the thrips that had colonised each flower in the laboratory.

Paradoxically, the results revealed more than twice as many thrips were colonising *Hibiscus* flowers, the minor host, than *Malvaviscus* even though more thrips were being caught at the *Malvaviscus* bushes than *Hibiscus.* When I followed this experiment up with lab tests with live thrips given a choice between *Hibiscus* and *Malvaviscus* flowers in a cage or Y-tube olfactometer, again *Hibiscus* emerged as the more attractive flower. But a further surprise came when I tested each flower in the Y-tube against a blank chamber, when around three times more thrips approached the blank chamber than either flower, suggesting the thrips are repelled by the scent of their host flowers. A similar result occurred when I tested the leaves and floral extracts compared to solvent in a circular area. The most probable conclusion from this seems to be that the red colour

Fig.1. *Hibiscus* flower

of *Hibiscus* and *Malvaviscus* flowers (Figs 1 and 2) rather than scent, attracts thrips.

To test if weather causes thrips to fly less and hide deep in flowers, I mounted a weather station on a university building roof that recorded hourly measurements of wind speed, wind direction, and atmospheric pressure. I also measured temperature and humidity using probes attached to *Malvaviscus* bushes. Over several days, with fine and rainy or stormy weather, I set up sticky traps on poles around *Malvaviscus* bushes and left them up from 8 am to 4 pm in order to catch thrips in flight, to provide an estimate of how many thrips were flying that day.

Fig.2. *Malvaviscus arboreus* flower

At the same time, I took flowers from several *Hibiscus* and *Malvaviscus* bushes and split them into tip and base sections, the tip being the most exposed part of the flower, before immersing in ethanol. If the thrips take shelter in response to oncoming rain, I expected to find them at the base of flowers more often in rainy than fine weather, and more often in *Malvaviscus* flowers because these are tubular shaped and more sheltered than the open cup *Hibiscus*. The number of thrips caught on traps and present in the tip and base sections of flowers was counted in the lab.

The data from the weather station was then used to search for any link between wind, rainfall, atmospheric pressure change, humidity and temperature. Curiously, neither rainfall nor any of the weather parameters measured had any influence on the numbers of thrips caught on traps, present in the tip rather than base of the flower or the relative number of thrips in *Hibiscus* and *Malvaviscus* flowers. So these thrips apparently do not have any behavioural adaptations to protect themselves from the weather.

The species *Frankliniella schultzei* originated in South America, in an environment where *Malvaviscus* is native and is likely to be an ancestral host plant of these thrips. By contrast, *Hibiscus* flowers would only have been encountered by the thrips in modern times. Possibly then, the attraction of thrips to *Hibiscus* flowers is because they have not until recently been under any selection pressure to differentiate between them, and with *Hibiscus* flowers being the same colour but larger they are probably more noticeable to the insects.

Red flowers are typically bird pollinated, so unlike other flowers derive no benefit from insect visitation and often have mechanisms to deter insects such as a lack of scent and their colour (red) being one that most insects cannot see, although these thrips are an exception. It seems that these flowers have developed insect-repellent properties that the thrips seem to overcome through their attraction to colour when searching for host plants.

The additional finding that thrips fly regardless of the weather is unexpected, but raises the possibility that these insects can survive being struck by raindrops. If this is the case, there would have been no need for thrips to evolve sheltering behaviour in anticipation of rainfall, instead continuing with their usual behaviours.

Lachlan completed his honours research in Professor Gimme Walter's lab in the School of Biological Sciences at UQ in 2015. Lachlan is currently working on his PhD.

Interactions between the epiphytic ant-plant *Myrmecodia beccarii* and its ant inhabitants

--Trevor Volp, recent Honours student
James Cook University

Ant-plants, or myrmecophytes, are plants that have evolved a mutualistic relationship whereby they house ant colonies in modified structures known as domatia. In return, ants can protect their plants from herbivory, encroaching vegetation, or, provision the plant with nutrients. Ant-plants are commonly used as model systems to study the ecology and evolution of insect-plant mutualisms. During my Honours year I studied the ecology of an epiphytic ant-plant mutualism from northern Australia.

Myrmecodia beccarii (Rubiaceae) (Figure 1A) is an epiphytic ant-plant found in north-eastern Queensland, between Cooktown and north of Townsville, with an additional population on Cape York Peninsula. During development, *M. beccarii*'s hypocotyl swells to form a tuber in which a series of cavities develop, creating nesting space for ants (Figure 1B). Colonies of the native ant *Philidris cordata* (Dolichoderinae) live inside these cavities. It has long been speculated that *Phi. cordata* provides *M. beccarii* with nutrients, based on knowledge of related ant-plants, although this has never been shown experimentally. The invasive African big-headed ant *Pheidole megacephala* (Myrmicinae) has also been observed inhabiting *M. beccarii*, however the current distribution of *Phe. megacephala* within *M. beccarii* populations is unknown. Additionally, no research had previously been conducted to examine how *Phe. megacephala* interacts with the plant.

During my Honours year, I discovered that *Myrmecodia beccarii* displays a high degree of specificity with *Phi. cordata*. This is in comparison to other epiphytic ant-plants which typically display loose ant-partner associations. In non-epiphytic ant-plants, when a high level of partner specificity is documented, the mutualisms are maintained by stabilising mechanisms. One such example is partner choice, whereby ants locate plants via plant released volatiles allowing for colonisation before suboptimal

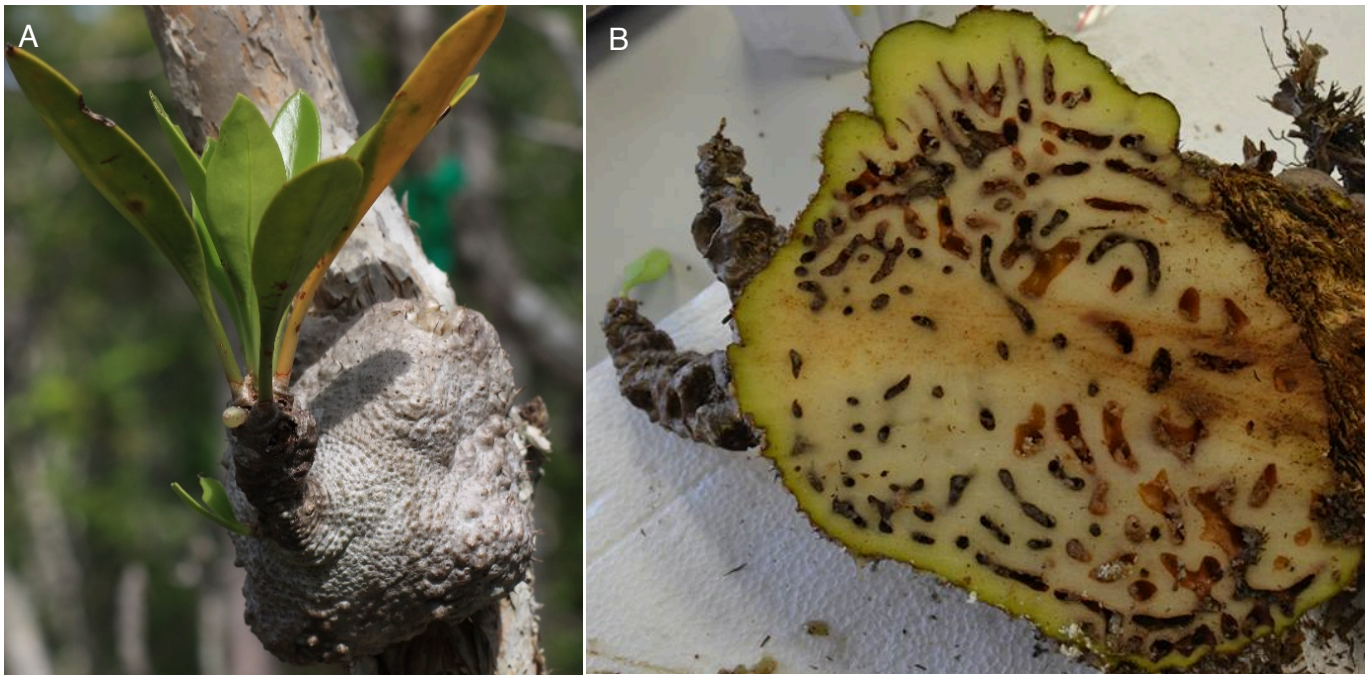


Figure 1: *Myrmecodia beccarii* in the field (A) and a dissected tuber with cavities (domatia) (B)

partners. Using y-tube olfactometry I examined the response of worker ants to volatile chemicals released from mature *M. beccarii* plants and seedlings.

I found that neither the native ant *Phi. cordata* nor the invasive *Phe. megacephala* were attracted to volatile chemicals released from *M. beccarii* seedlings or mature plants. However, *Phi. cordata* were repelled by mature plants, which was a response restricted to the native ant. From my data I was unable to explain the repellent effect with plant characteristics (number of leaves, floral buds, or flowers). However, one possible hypothesis to explain my results is that mature *M. beccarii* plants are releasing floral volatiles to repel ants to prevent sterilisation. Alternatively, they may be releasing a signal to prevent colonisation of plants. Further examination of this phenomenon is required to adequately explain my results.

Additionally, I examined what role the *M. beccarii* – *Phi. cordata* mutualism plays in structuring the arboreal ant communities of paperbark woodlands of Cairns and Cardwell. I surveyed nocturnal arboreal ant communities on trees with and without ant-plants by baiting and visual observation. The distribution of *Phi. cordata* in arboreal ant communities was limited by the distribution of ant-plants. This indicates that *Phi. cordata* are nest-site limited, a common trait among cavity-nesting arboreal ants. *Philidris cordata* were also more likely to be the dominant ant species on trees with ant-plants present, indicating ant-plants may play a role in competition dynamics of these ant communities.

Finally, I examined the ability of plants to uptake nutrients from their ant inhabitants. I ran two isotope pulse-chase experiments, whereby I fed ant colonies residing inside ant-plants with a solution labelled in the rarer, heavier isotope of Nitrogen (^{15}N). I sampled plant leaves before and after feeding the ants the isotope label to examine if the ^{15}N pulse was transferred from the ants to the plant. Plants were able to uptake nitrogen from both *Phi. cordata* and *Phe. megacephala*, the native and invasive ant species respectively. My results did not show any difference in the percent of nitrogen plants received from the different ant species.

These results document the ability of *M. beccarii* plants to obtain nutrients from their ant inhabitants, both native and invasive species. This mutualistic relationship likely enables *M. beccarii* to exist in the nutrient poor epiphytic habit by receiving nutrients from its ant symbionts. Additional work is currently being undertaken to further clarify this nutrient provisioning relationship over time, and to discriminate any fine scale differences between the native and invasive ant species.

Acknowledgements: Drs Lori Lach and Lucas Cernusak for supervision of the project. Funding for this research was provided by: James Cook University, Skyrail Rainforest Foundation, Wet Tropics Management Authority, and the Julia Cooper Memorial Wildlife Research Bursary. Finally, the project wouldn't have been possible without assistance from an intrepid team of volunteers and technical staff.

Trevor completed his honours research in Dr Lori Lach's lab in the College of Science and Engineering at James Cook University-Cairns in 2015. Trevor is currently working with the Queensland Department of Ag. and Forestry at Kingaroy.

UQ Insect Science Field trip: Saturday 8 October from 10 am

Kathy Ebert is organising a field trip for the UQ Insect Science students. We are planning to go to the Gold Creek Reservoir at the end of Gold Creek Road in Brookfield on Saturday the 8th of October from 10am. While this event is not an official BugCatch, ESQ members are welcomed and encouraged to join us to share your knowledge and expertise with these enthusiastic students. It is also a great chance for other students and interested families to come along and learn about insects and collecting.

If you are interested in attending, please contact Kathy Ebert at k.ebert@uq.edu.au
For more information about the area see: http://www.moggillcreek.org

Entomology News

from Queensland and beyond...

UQ researchers revise group of gall-inducing scale insects

Lead author Penny Mills and three co-authors (Tom Semple, Kate Garland and Lyn Cook) have recently published an article revising a group of scale insects found within the gall-inducing genus *Apiomorpha*. The paper includes descriptions of two newly discovered species from Western Australia. One of the species resembled an already described species, but DNA, adult female morphology and host use were used to differentiate the two species. The galls induced by females of the other species are covered in brittle woody protrusions that break off easily to leave older galls looking like knobbly sea cucumbers.

The first newly described species has been named *Apiomorpha gongylocarpae*, after its eucalypt host (*Eucalyptus gongylocarpa*) found in inland Australia. The second species, *Apiomorpha jucundacrispi*, has been named after its rare eucalypt host (*E. jucunda*); with the second part of the specific name "*crispi*" in honour of Professor Michael Crisp, a botanist from ANU who was the one to find the first galls of the species. The Latin word "*crispus*" translates to "curly", a suitable description for the unusual-looking younger galls of this species.

Fig. 1. Galls from *Apiomorpha jucundacrispi* (left) and *A. gongyloparcae* (right). Photo: Lyn Cook

To find out more:
Mills, PJ, Semple, TL, Garland, KLS and Cook, LG. 2016. Two recently discovered species of *Apiomorpha* (Hemiptera: Eriococcidae) feeding on eudesmid eucalypts in Western Australia reaffirm host conservatism in this gall-inducing scale insect genus. *Invertebrate Systematics*. Vol 30(3): 255–273.
See:
http://www.publish.csiro.au/paper/IS15039.htm

2016 Australian Natural History Medallion awarded to Max Moulds

It gives us great pleasure to announce that Dr Max Moulds has been awarded the 2016 Australian Natural History Medallion. The Australian Natural History Medallion is awarded each year to the person judged to have made the most meritorious contribution to the understanding of Australian Natural History and is administered by the Field Naturalists Club of Victoria Inc.

The Entomological Society of Queensland nominated Max for the award because of his remarkable contributions to the field of Australian entomology. For those of you that know Max personally, have read his publications, or enjoyed his ESQ Seminar (see ESQ News Bulletin 43[6] for details of Max's life story), we are sure you all agree that he is a very worthy recipient and will join us in congratulating Max for this achievement.

ESQ members are welcome to attend his award ceremony in Blackburn, Melbourne, on Monday 7 November 2016. More details should be available for the next bulletin.

Have we got the heaviest dragonfly and can it fly in the wheel position?

--Geoff Monteith, Queensland Museum

Dr Graham Dorrington is a Cambridge-trained aeronautical engineer who was one of the pioneers of building powered airships to explore the biological mysteries of rainforest canopies (http://www.dendronautics.com/). His early exploits with experimental canopy airships in Borneo and Sumatra led to him becoming the main protagonist in a 2004 documentary film, *The White Diamond,* by legendary German director, Werner Herzog, in which Graham flew one of his machines across the South American rainforest wilderness to the towering Kaieteur Falls in the heart of Guyana. Following some years in the aerospace industry Graham is now an academic in the Engineering School at the Bundoora campus of RMIT University in Melbourne.

Dr Dorrington has turned some of his energies from flying machines to flying insects. In a remarkable paper just published in the palaeontology journal *Lethaia* (Dorrington 2016) he brings his aeronautical expertise to bear on the problems of flight of maximum sized dragonflies in both the modern fauna and in the giant fossils known from 300mya in the Carboniferous era, particularly as it may have been influenced by changing atmosphere composition and density over geological time. Following complex mathematical considerations of potential muscle power and body weights he presents the hypothesis that the maximum size of living dragonflies is constrained by a performance limit, viz. the wing muscle power required to permit males to carry heavier females in the so-called

Fig. 1. Dr Graham Dorrington, RMIT University, Melbourne.

'wheel position' in flight. The 'wheel position' is of course the unique mating method of dragonflies in which the male clasps the female behind her head with his terminal claspers while she brings her abdomen forward to lock onto the sperm carrying

Fig. 2. The 2.71gm weighed female specimen of *Petalura ingentissima* from Thiaki, Atherton Tableland. The scale shows its wing length is close to 80mm.

Petalura ingentissima, Tillyard, 1908. Photo: David Rentz, Atlas of Living Australia

structure behind his thorax which he has 'pre-loaded' with sperm before making the copulation attempt. They remain in this position for long periods during flight. He proposes that the giant fossil dragonflies (more properly "griffenflies" since they are now regarded as a separate order from modern Odonata) would have been too large to allow use of the "wheel position" and did not possess the genital structures to allow them to do so. This, as well as the flight potential of the different prevailing atmosphere 300mya, may have allowed them to reach the enormous size they did, which is four times the size of the biggest modern species. .

The largest modern dragonfly is *Tetracanthogyna plagiata,* from the rainforests of Borneo, Sumatra and the Malay Peninsula with a wingspan of 172mm (Beccaloni, 2010) and not far behind it is Queensland's *Petalura ingentissima* from the Cairns region with wingspan only a smidgin less. But they live in far off places and rarely are reliably weighed live weights available to use in considerations of flight ability. During his preliminary work, Graham had appealed to the Queensland Museum for live weights of *Petalura ingentissima*. Quite by chance a few weeks later, in January 2014, I managed to catch by hand a perched female specimen on the edge of the rainforest at "Thiaki" on the Atherton Tableland. Since I had a bucket of fifty dung beetle traps in the other hand, that particular insect probably set a record for slow stupidity among its fellows of this notoriously fast and high flying species. Having nothing to put it in, I carried it alive the half kilometer back to the car and was painfully bitten several times, drawing blood and giving me new respect for the predatory powers of these impressive animals. It was weighed on the electronic balance at the CSIRO labs in Atherton, yielding a figure of 2.71 gm. It had a forewing length of 78mm which places it in the upper range of the species. The specimen and its data were supplied to Graham who notes in his paper that it 'far exceeds any previous recorded mass for Odonata'. So, for the moment, Queensland has the record for heaviest dragonfly in the world, bearing in mind, of course, that no live weights are available for the SE Asian giant which is slightly bigger in wingspan dimensions.

Graham Dorrington's calculations indicate that *Petalura ingentissima* is probably at the upper limit of size for a dragonfly male to be able to carry its even larger female in the wheel position. He notes that there are observations of the much smaller Sydney species, *Petalura gigantea*, flying in wheel position but there are not documented records of *P. ingentissima* doing so. He would be delighted to receive any careful observations of wheel position in the species, as well as further accurate live weights. Of particular value would be video footage of flight in the species, especially if in the wheel position, together with any information that could be reliably observed on flight speed, duration and lift rates while in cop. His contact details at RMIT Melbourne are easily obtained by searching on his name.

REFERENCES

BECCALONI, G. 2010. *Big bugs lifesize* Natural History Museum, London, 84pp.

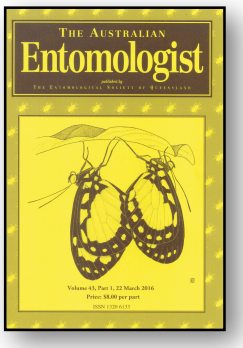
DORRINGTON, G. E. 2016. Heavily loaded flight and limits to the maximum size of dragonflies (Anisoptera) and griffenflies (Meganisoptera). *Lethaia* 49: 261–274. *(* http://dx.doi.org/10.1111/let.12144 *)*

The History Corner...

Alfred Roy BRIMBLECOMBE (1909-2001)

Alf Brimblecombe was born to a crop and dairy farming family at Forest Hill, near Laidley. He joined Qld. Dept. of Agriculture and Stock as a clerk in 1926 and studied part time at Univ. Qld. to gain a B.Sc. He became responsible for forest entomology in 1934. Undertook a study of pine bark weevil (*Aesiotes notabilis)* which earned an M.Sc. from UQ in 1938. Worked widely on timber insect problems including role of starch content of post harvest logs. Began basic taxonomic studies on Australian scale insects in 1953, submitted for Ph.D. awarded by UQ in 1959. Continued scale insect work almost until retirement. In 1961 became more widely involved in agricultural entomology as Deputy Government Entomologist. Placed emphasis on understanding pest problems as part of the whole agroecosystem and guided staff towards beginnings of integrated pest control strategies. Became Govt. Entomologist on retirement of W.A. McDougall in 1971, then Director of the newly formed Entomology Branch. Retired in 1973. Active in Entomological Society of Queensland which he served as Secretary (1939-40), President (1941) and Treasurer for 14 years (1950-63). Awarded Honorary Life Membership in 1973. President of Royal Society of Queensland in 1958.

Biography: Passlow, T. 1973. *News Bulletin of the Entomological Society of Queensland* **99:** 14-15.

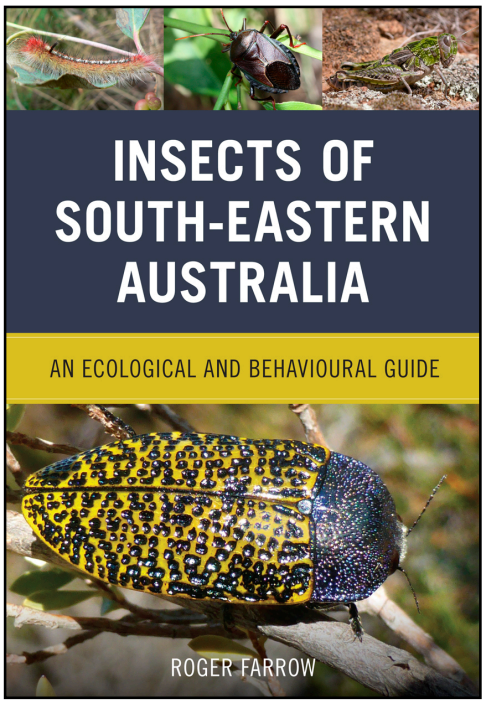


AN INVITATION TO SUBSCRIBE

"The Australian Entomologist": A quarterly scientific journal devoted to entomology of the Australian-Pacific Region. 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. For subscription forms and Price list for 2016 see:

http://www.esq.org.au/publications.html

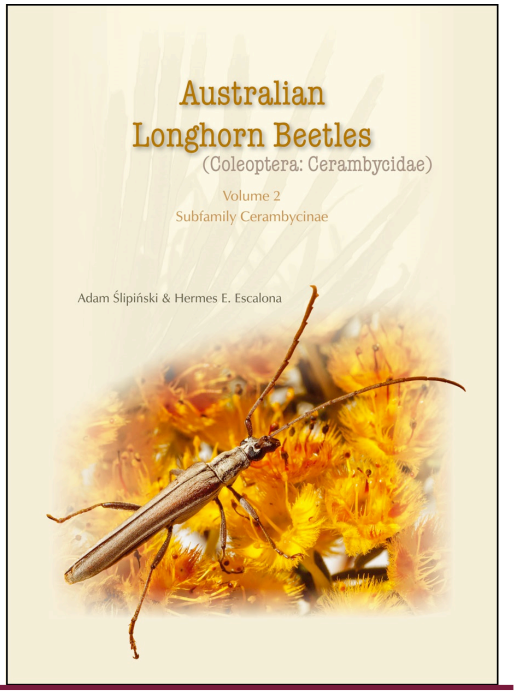
Insects of South-Eastern Australia – an Ecological and Behavioural Guide.



by Roger Farrow, 288pp, 215x148 mm, paperback, 2016, CSIRO Publishing, ISBN 9781486304745, Price $45, available at: http://www.publish.csiro.au/pid/7435.htm

The author of this slightly quirky book spent his career as an insect field ecologist studying locusts and other insects first in Africa and later with CSIRO in Australia. Since retirement to his rural property south of Canberra he has roamed the bush with a camera, a questioning mind and a good knowledge of the plants. The book is a compilation of several hundred insect photographs from south eastern Australia, with a strong concentration on the Australian Alps and adjacent regions. They are not arranged under taxonomic categories, but under a multitude of loose headings of ecological or behavioural themes such as “sap feeders”, “under eucalypt bark”, “mimics”, “social insects”, “blood feeders”, “grassland insects” and so on. The background text is fairly thin but an enormous amount of information is given in the extended captions to each photo which deal with food plants, behaviour, metamorphosis and other snippets. It’s a fascinating book which can be leafed through to constantly reveal something surprising and new. Scattered through the book are Text Boxes containing short illustrated essays on themes such as migration, insect conservation, ant attendance, etc. At the rear there is a cross-referenced taxonomic list which allows particular families or species to be tracked through the book.

Australian longicorn beetles (Coleoptera: Cerambycidae). Volume 2 Subfamily Cerambycinae.



by Adam Slipinski and Hermes Escalona, 2016, 640 pp, hardback, 297 X 210 mm, CSIRO Publishing. ISBN 9781486304585. Price $160, available from: http://www.publish.csiro.au/pid/7426.htm

This magnificent book is the second in the 3-volume series on Australian longicorn beetles being progressively produced by ANIC’s Adam Slipinski and Hermes Escalona. It follows on from Volume 1 which appeared in 2013 and won them the prestigious Westwood Medal for Excellence in Taxonomy earlier this year. Volume 1 dealt with the Lamiinae which had 74 valid genera at the

end of the revisionary exercise which involved sinking no less than 75 genera. Volume 2 deals with the larger Subfamily Cerambycinae with an almost equally radical restructuring of the generic framework yielding 142 valid genera after the description of 13 new genera and the sinking of 18 others. The book features state of the art photography throughout with a good selection of genera shown in live shots from the field, including a range of rarely photographed mimics. The key to genera has every character illustrated in detailed morphological photographs, often labelled and colour coded, directly opposite the relevant part of the key. Most of the original primary type specimens of described species are also shown in colour. We now look forward to Volume 3 which will deal with the Prioninae, a group which to date have been almost unidentifiable in Australia.

Upcoming Workshop

Changes to Biosecurity Legislation - Are you complying?

On 16 June 2016, the Federal Government introduced the Biosecurity Act 2015, replacing the Quarantine Act 1908. Science Industry Australia is hosting a series of Biosecurity Update Workshops around Australia with one being held in Brisbane on Monday, November 21st at the Brisbane Convention and Exhibition Centre. This Biosecurity Workshop will provide attendees with knowledge they need to assess the impact, application and identify any actions needed to comply with the newly introduced Biosecurity Act 2015.

This workshop will cover:

- The Department's risk based approach to modern biosecurity management and regulation
- The legislative and administrative framework, including new terminology
- The key roles recognised by the new legislation
- Biosecurity control and risk assessements
- Powers, including control orders and conditioning powers
- Biosecurity zones
- Impacts on workplaces
- Changes to import conditions and permits
- Changes to approved arrangements, auditing and reporting requirements
- Compliance and enforcement tools
- Review of decisions and appeals
- Transitional arrangements

This workshop is suitable for all staff charged with the responsibility for biological products, quarantine premises and approved persons. It is suitable for suppliers, end users and any staff who are responsible for conforming with Biosecurity legislation. This workshop is hosted by Science Industry Australia and the Australasian Laboratory Managers Association (http://scienceindustry.com.au/workshops/#axzz4HqNji2Gp)

If you require further information, please don't hesitate to contact Danielle Butcher, the Executive Officer at Science Industry Australia (SIA) for more information at sia@scienceindustry.com.au or
Mobile 0438 520 227 | Phone 61 3 9872 5111 | Fax 61 3 9872 5566

Announcements and Notices

LAST CHANCE!!
closing date 31 August

Attention honours and postgrad students:

Phil Carne Prize 2016!

The upcoming Australian Entomological Society Conference to be held in Melbourne this November (http://www.aesconferences.com.au) will feature a Phil Carne Prize symposium, so chances of receiving travel sponsorship (up to $1000!!) to the conference are greater than in the past! On top of that, the best speaker at the symposium wins a further $1500 cash prize!!

The prize is open to any honours or postgraduate student enrolled in an Australian University, either full-time or part-time, who has not submitted their thesis by the **closing date of August 31st.**

Entrants must be members of the Australian Entomological Society.

Entries for the prize should be in the form of a scientific paper that deals with research on any entomological topic (or allied group of terrestrial organisms such as mites or spiders). The paper can be in the form of a scientific manuscript ready for publication, a paper that has been accepted for publication or a paper published since the beginning of the previous year to the closing date, but must result from the student's higher degree studies.

Please check the Australian Entomological Society under Awards for further details and for your copy of the application form.

Off to Orlando next month??

Free Mixer at ICE 2016 for Australian Entomological Society Members and Friends!

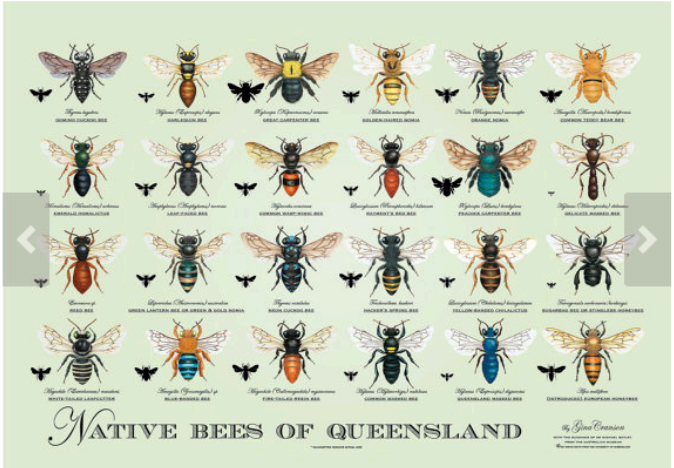
Attention all members and friends attending the International Congress of Entomology in Orlando, Florida, at the end of September. The Australian Entomological Society has organised a mixer event at the Congress, with details as follows:

Event Name: Members and Friends of the Australian Entomological Society Mixer
Date: Tuesday, September 27
Time: 5:00PM-7:00PM
Location: Rosen Plaza Hotel, Orlando
Room: Salon 9

The event will also be listed in the Congress program. We hope to see all members of the AES and friends at the mixer.

Native bees of Queensland Poster

Gina Cranson's amazing artwork now includes native bees of Queensland poster! To see more of her native bee artwork see:
https://www.etsy.com/shop/GinaCransonArtworks



Meetings & conferences

The International Conference on Ant Systematics and Ecology
September 17-18, 2016
University of Kelaniya, Sri Lanka.
http://www.kln.ac.lk/units/ICASE2016/

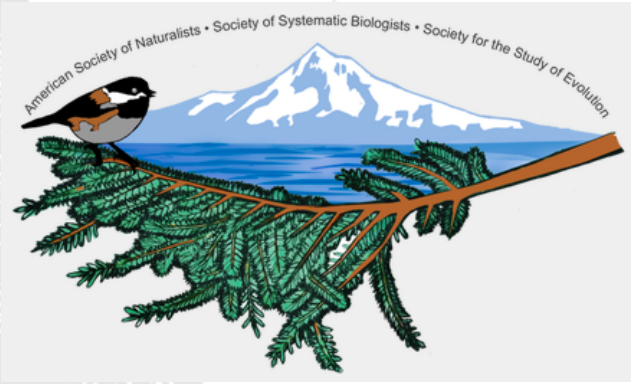
XXV International Congress of Entomology: Entomology Without Borders
September 25–30, 2016
Orlando, Florida, USA
http://ice2016orlando.org/

Australian Entomological Society and Entomological Society of New Zealand 47th AGM and Scientific Conference
27-30 November 2016
Melbourne, AUSTRALIA
http://www.aesconferences.com.au/

Gordon Research Conference SPECIATION 2017
February 19–24, 2017
Renaissance Tuscany Il Ciocco Lucca (Barga), ITALY
https://www.grc.org/programs.aspx?id=16903

3rd Hemipteran-Plant Interactions Symposium
June 4–8, 2017
Madrid, SPAIN
http://www.hpis2017.csic.es/

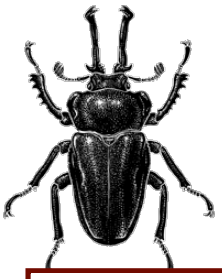
The 5th International Forum for Surveillance and Control of Mosquitoes and Mosquito-borne Diseases
May 22-26, 2017
Nanjing, Jiangsu Province, China.
www.asiansvemc.org or www.mosquitoforum.net.



EVOLUTION 2017
Joint Congress between the American Society of Naturalists (ASN), The Society of Systematic Biologists (SSB) and the Society for the Study of Evolution (SSE)
23-27 June 2017
Portland, OR
http://www.evolutionmeetings.org/future-meetings-2017.html

3rd BioSyst.EU meeting
August 15–18, 2017
University of Gothenburg, SWEDEN
http://www.conferencemanager.se/BiosystEU2017/

16th Congress of the European Society for Evolutionary Biology
20-25 August 2017
Groningen, the Netherlands
http://www.eseb2017.nl/



Diary Dates for 2016

Meetings held on the second Tuesday of the respective month

MARCH 8	Federica Turco	AGM and Presidential Address: " *Not only darkling beetles: a professional and personal journey among Tenebrionoidea beetles"*
APRIL 12	Nigel Stork	*"How many species are there on Earth"*
MAY 10	Michelle Gleeson	*"Little Bug-ers: educating and inspiring the next generation of budding entomologists"*
JUNE 14	Notes and Exhibits	Student Award Presentation/ Notes & Exhibits
AUGUST 9	Julianne Farrell	*"Processionary caterpillars: their ecology and relationship to equine foal deaths"*
SEPTEMBER 13	Kumaran Nagalingam	*"Functional role of male lures of Bactrocera fruit flies: potential to maximise their use in pest management*
OCTOBER 11	Madaline Healey	*"Barefoot entomology – working as an entomologist in Laos", ACIAR Biocontrol in the Mekong*
NOVEMBER 8	Romina Rader	*"To be announced" on Community Ecology*
DECEMBER 13	Notes & Exhibits	Notes and Exhibits/Christmas Afternoon Tea

SOCIETY SUBSCRIPTION RATES

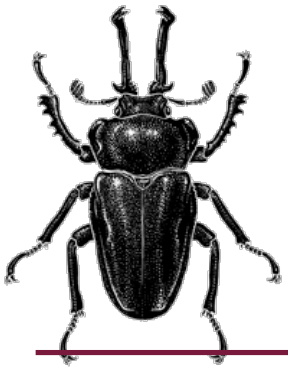
GENERAL	Person who has full membership privileges	**$30pa**
JOINT	Residents in the same household who share a copy of the *News Bulletin*, but each otherwise have full membership privileges.	**$36pa**
STUDENT	Student membership conveys full membership privileges at a reduced rate. Students and others at the discretion of the Society Council.	**$18pa**

ESQ membership subscriptions should be sent to the Treasurer, PO Box 537, Indooroopilly, QLD 4068
http://www.esq.org.au/membership.html

THE *AUSTRALIAN ENTOMOLOGIST* SUBSCRIPTION RATES

AUSTRALIA	Individuals/Institutions	**AU$33pa/AU$37pa**
ASIA/PACIFIC	Individuals/Institutions	**AU$40pa/AU$45pa**
ELSEWHERE	Individuals/Institutions	**AU$45pa/AU$50pa**
ELECTRONIC	Individuals/Institutions	**AU$25pa/AU$30pa**

Journal subscriptions should be sent to the Business Manager, PO Box 537, Indooroopilly QLD 4068
http://www.esq.org.au/publications.html



Entomological Society of Queensland

Notice of next meeting:

Tuesday, September 13th, 2016, 1:00 pm

Dr. Kumaran Nagalingam

from Queensland University of Technology, Department of Earth, Environmental and Biological Sciences

will present

Functional role of male lures of Bactrocera fruit flies: potential to maximise their use in pest management

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

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 44, Issue 6 (September 2016)

CONTRIBUTIONS WELCOME

Deadline Thursday, September 22nd, 2016.

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