Entomological Society of Queensland

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Front Cover: A photograph of the saltmarsh mosquito, *Aedes vigilax*. This species is found in coastal saltmarshes and mangroves from the south coast of New South Wales north around the continent and down to the southwest corner of Western Australia, and in the Riverland and Adelaide region of South Australia. Its drought-resistant eggs are laid in the margins of temporary pools that are flooded by peak tides or rain events. On subsequent inundation, these eggs can hatch simultaneously in millions, taking as little as 7-8 days to develop into adults. The adult mosquitoes are renowned for their capacity to disperse over many kilometres. This makes them the worst pest species in coastal Queensland, where the larvae are the target of aerial spraying programs by councils from the Gold Coast to Noosa. *Photo by Stephen Doggett, Department of Medical Entomology, NSW Health Pathology, Westmead Hospital. Used with permission.*

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Entomological Society of Queensland

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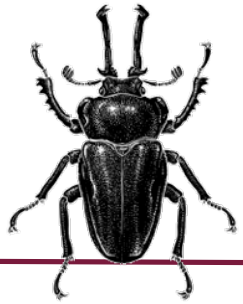
The **ENTOMOLOGICAL SOCIETY OF QUEENSLAND**, since its inception in 1923, has striven to promote the development of pure and applied entomological research in Australia, particularly in Queensland. The Society promotes liaison among entomologists through regular meetings and the distribution of a *News 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, May 8th, 2018
Held in the Seminar Rooms, Ecosciences Precinct, Boggo Rd, Dutton Park.
Meeting open: 1:05 pm

Attendance (56):

Members (30): Don Sands, Jonathan Darbro, Shun Takano, Jane Royer, Nancy Schellhorn, Rebecca Nagy, Cate Paull, Mukurd Madhav, Pauline Wyatt, Mona Moradi, Vivian Sandoval, Lisa Rigby, Chris Lambkin, Lui Lawrence-Rangger, Shannon Close, Christine Goosem, Penelope Mills, Bradley Brown, Geoff Monteith, Liam Bromley, Anna Marcora, Andy Hulthen, Lachlan Jones, Tim Heard, Greg Daglish, Melissa Starkie, Mark Schutze, Mike Muller, Jaye Newman, Francesca Strutt

Visitors (26): Jens Froese, Justine Murray, Geoff Brown, Joanna Blessing, Sara Clifford, Wenjun Liu, Roger Mitchell, John Thomas, Kathy Crew, Brendan Missenden, Tracey Steinrucken, Zack O'Brien, Florian Schwarzmueller, Sandy Jaenisch, Lyn Cox, Anne-Marie Hero, Anne Bourne, Christina Dott, Mike Barnett, John Thomas, Peter James, Jim Payne, Tobias Bickel, Margot Simpson, Nicole Forrest, Chris Pratch

Minutes: The minutes of the last meeting were circulated in News Bulletin 46[2] April 2018. Moved the minutes be accepted as a true record: Cate Paull; Seconded: Penny Mills; Carried: All.

Nominations for membership approved by council:

No new members this month!

General Business:
Mike Muller (President) announced the two joint winners for the 2018 Student Award:

Melissa Starkie. Thesis title: Is ITS1 barcoding an effective tool for use in tephritid fruit fly diagnostics?

Perry Bennion. Thesis title: Phylogenetic investigation of *Podomyrma* ants and their *Psydrax* hosts, and assessment of their nest associates in eastern Australia

Main Business:
The history of Aedes aegypti *in Southeast Queensland and novel techniques for its surveillance and control*' by Brendan Trewin (Postdoctoral Fellow, Vector Ecology, Health & Biosecurity, CSIRO). Mike provided the vote of thanks.

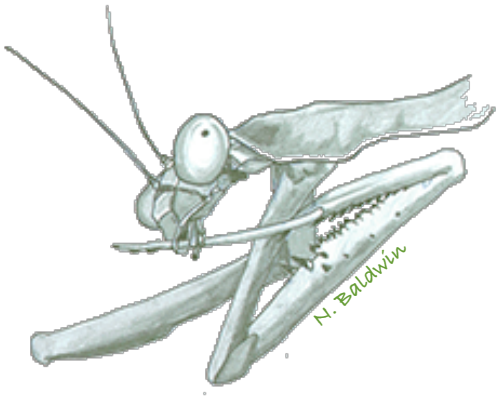
Next meeting: 12th of June: Notes and Exhibits! Please contact ESQ President, Mike Muller, if you would like to present. Melissa Starkie will also present on her thesis topic. Perry Bennion is overseas and unable to present.

Meeting closed: 14:00.

A common jezebel, *Delias nigrina*, in a west Brisbane garden.

At our next meeting...

Notes & Exhibits!!



This is a more informal meeting where we have a variety of short presentations. Anyone is welcome to share.

Come and see:

2018 ESQ Student Award Winner, Melissa Starkie from the Queensland University of Technology, will talk about her Honours thesis research: *" Is ITS1 barcoding an effective tool for use in tephritid fruit fly diagnostics? "*

Dr Vivian Sandoval-Gomez will give an overview of her research on minute fungus beetles (Family Ciidae).

Dr Christine Lambkin will present an update on permits "*Additional ESQ Requirements for QLD Collecting Permit – Why?*"

Plus more.... any one is welcome to present a short 5-10 minute informal talk or demonstration or present an exhibit!

Contact Mike Muller if you have something you would like to share at muller36@bigpond.net.au

Tuesday 12th June at 1 pm

Seminar Room at EcoSciences. Tea & coffee following.

All welcome!

ESQ Student Awards 2018

The Student Award was established by the Society to encourage entomological research. It is open to any student who completed an Honours Degree, Postgraduate Diploma or 4-year Undergraduate Degree at a Queensland tertiary institution in the previous calendar year. Entries are judged by a panel of three Members appointed by the President. This year, the judging panel was unable to separate the top two submissions and as a result there are two winners, as announced at the General Meeting on May 8. They are as follows:

Melissa Starkie - For her Bachelor of Science (Honours) thesis at QUT. ***Is ITS1 barcoding an effective tool for use in tephritid fruit fly diagnostics?***

Perry Bennion - For his Bachelor of Science (Honours) thesis at the University of Queensland. ***Phylogenetic investigation of* Podomyrma *ants and their* Psydrax *hosts, and assessment of their nest associates in eastern Australia: Early investigations into an Australia Ant-Plant interaction and its associates.***

Under the terms of the Award, the winners are asked to present on their topics at the Notes and Exhibits Meeting in June. Melissa Starkie will give a presentation at the meeting on 12 June. Perry Bennion is currently overseas and his presentation will be made at a suitable meeting on his return.

Dengue and *Aedes aegypti* in Australia: history, risk of invasion and novel methods for elimination

Presented by
Dr Brendan Trewin
Postdoctoral Fellow
CSIRO Health & Biosecurity Business Unit

Mosquito-borne pathogens are increasingly threatening human health, exerting a large burden on economic and health systems across tropical and subtropical regions. The World Health Organisation (WHO) describes dengue fever as the most rapidly spreading mosquito-borne viral disease of the past 50 years (WHO, 2012), with estimated worldwide annual infections ranging from between 50 and 390 million cases (Bhatt *et al*., 2013). However, it is not just dengue taking a toll on vulnerable human populations. Since 2013, Zika has spread out of Africa, across the Pacific and into South America. The WHO has estimated that 1.5 million cases occurred in Brazil during the 2015 epidemic, with the first emergence of microcephaly in new-born children as a result of the infection (WHO, 2016). Yellow fever, a vaccine preventable disease, has also seen a re-emergence since 2017. The threat is so serious that the Brazilian government will immunize the country's entire population of 200 million by 2019 (NYT, 2018). This increase in disease prevalence is largely due to a rapid growth in urbanisation, international trade and travel, and the spread of major vectors including *Aedes aegypti* and *Aedes albopictus* (WHO, 2012).

The mosquito *Ae. aegypti* is the only vector of these viruses on mainland Australia. It is here in Brisbane that this species was first implicated as the vector of dengue by Thomas Bancroft in 1905 (Bancroft, 1906). Thomas Bancroft continued the work of his father, Joseph Bancroft, who found that *Culex* mosquitoes transmitted the roundworm responsible for filariasis (Bancroft, 1880). These world class medical entomologists have been honoured by the QIMR Berghofer Medical Research Institute who named one of their buildings after the family. It was here at QIMR Berghofer that many scientific breakthroughs have been made by medical entomologists working on the mosquitoes found in Queensland. The late Brian Kay successfully led the mosquito control laboratory at the Institute for many years, finding success in Vietnam by preventing the transmission of dengue in villages, using freshwater copepods to control larval mosquito stages in water storage jars (Kay and Nam, 2005). It was towards the end of Brian's time at the Institute that he was part of the group that discovered the virus blocking potential of *Wolbachia* in *Ae. aegypti* (Moreira *et al*., 2009).

It is in Brisbane that Australia's longest running mosquito control program has been in operation since 1934. This group was formed after four severe epidemics of dengue fever occurred in the city in 1897/98, 1905, 1911 and 1925/26 (Lumley and Taylor, 1943). These epidemics affected between 70-90% of the population and were responsible for 275 deaths in the city and 733 across the region (Lumley and Taylor, 1943). *Aedes aegypti* was in

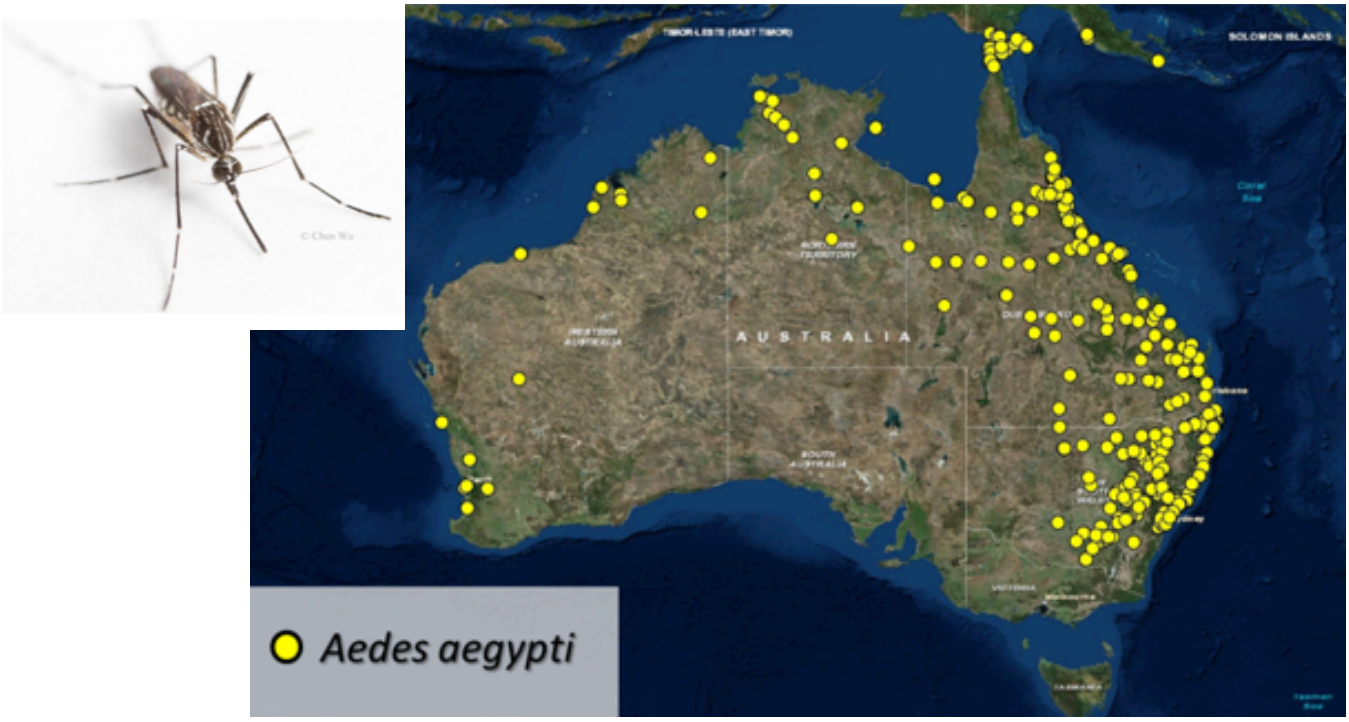


Fig. 1. Historical distribution of *Aedes aegypti*. Inset: *Ae. egypti*

large abundance and highly prevalent in unsealed rainwater tanks throughout the city (Cooling, 1923) (Fig. 2). With the confirmation that *Ae. aegypti* was responsible for transmitting the disease in 1918 (Cleland et al., 1918), steps were taken to eliminate the species from large urban environments (Hamlyn-Harris, 1931). Many hypotheses have been put forward by scientists for why the species disappeared from the region by mid-century (Russell *et al*., 2009). A review of council records as part of my PhD revealed that anti-mosquito regulations, first introduced in 1911 and enforced after 1934, allowed authorities to ensure larval habitats (including rainwater tanks) were sealed or removed from dwellings across the city (Trewin *et al*., 2017). It is likely that many other factors played a role, such as the introduction of reliable and higher quality reticulated water, which meant rainwater tanks were no longer valued by residents as a source of potable water. As such, Brisbane has not had a case of local dengue transmission since 1947 and *Ae. aegypti* has not been recorded outside of first ports since 1957 (Trewin et al., 2017, Fig. 1).

However, a severe drought in the early 2000s has resulted in the re-introduction of thousands of rainwater tanks into urban landscapes across the country (Fig. 2). In Queensland, the government passed legislation that mandated rainwater tank installations on new buildings, and rebate schemes from local and state governments meant tanks effectively cost nothing to install (Moglia, 2013). Legislated water restrictions enforced a culture of water hoarding, with increased water storage observed across Brisbane (Trewin *et al*., 2013). From surveys done at QIMRB in 1998 that observed no rainwater tanks, it is now estimated that ≈40% of homes have a rainwater tank, with rebate schemes suggesting that there are greater than 93,000 in Brisbane alone. This should not be cause for concern in itself, because rainwater tanks are designed to last for over 20 years and entrances are supposed to prevent the movement of mosquitoes in and out of the structures. However, surveys from local councils in the region are estimating that between 17% and 30% of tanks could now be non-compliant with regulations and indications point to mismanagement by owners.

My PhD was designed to look at the risk that *Ae. aegypti* would again make its way back into Brisbane and re-establish through these rainwater tanks. The second chapter, as mentioned above, looked at reasons for why the mosquito disappeared.

The fourth chapter examined how the temperature buffered environment within rainwater tanks affected the growth and survival of *Ae. aegypti* during winter. Temperatures were measured using data loggers in buckets and rainwater tanks in backyards across Brisbane and daily fluctuations were used to test for the potential for *Ae. aegypti* to survive these winter temperatures. In the laboratory, I observed greater than 48% survival (egg to adult) and mean time to adult development was 32 days. As such, a population of *Ae. aegypti* could survive in both buckets and rainwater tanks exposed to the coldest water temperatures in Brisbane. Evaporation rates in buckets indicated that any container with a volume greater than 3.4L would be sufficient to allow emergence during winter, assuming ideal nutrition. This is the risk that rainwater tanks present – a permanent source of larval habitat throughout the year in a region that is sub-optimal for survival.

The sixth chapter examined the role that a network of unsealed rainwater tanks may play in the spread of an *Ae. aegypti* invasion in Brisbane. Using a spatially explicit network model I simulated the movement of mosquito populations through known locations of rainwater tanks, and compared different scenarios of non-compliance across 140 Brisbane suburbs. Movement was parameterised using an isotropic Gaussian dispersal kernel, a maximum distance of movement, average life expectancy and the probability of *Ae. aegypti* crossing a road over a two week period. A risk map was developed to show areas of Brisbane that had the highest number of infested tanks over a period of 5 years and under a 90% non-compliance scenario (Fig. 3). Unsurprisingly, these suburbs tended to be those with the highest numbers of rainwater tanks, however, they were also predicted by small block size and short road length. Taking a closer look at these suburbs indicated that connectivity was enhanced by cul-de-sac designs where dead-end streets were common and blocks were more continuous landmasses. Findings should help authorities to target areas for future mosquito and rainwater tank surveillance. Finally, when comparing total area of spread between different levels of non-compliance and suburb risk, I found that there was a rapid change from 10% to 30% non-compliance in moderate and high risk suburbs. This suggested that rapid spread may be prevented by ensuring that the rainwater tank stock remains below 10% non-compliance. This observation may be similar to the effect of vaccines, where rates of >80% can prevent the spread of disease within a human population.

The outcomes of my thesis demonstrated that the permanent water stored in rainwater tanks presents ideal larval habitat for the re-establishment and persistence of *Ae. aegypti* in areas south of its current distribution in Queensland. Ongoing management of rainwater tanks in South East

Fig. 2. Brisbane water tanks: the old (right) and the new (left).

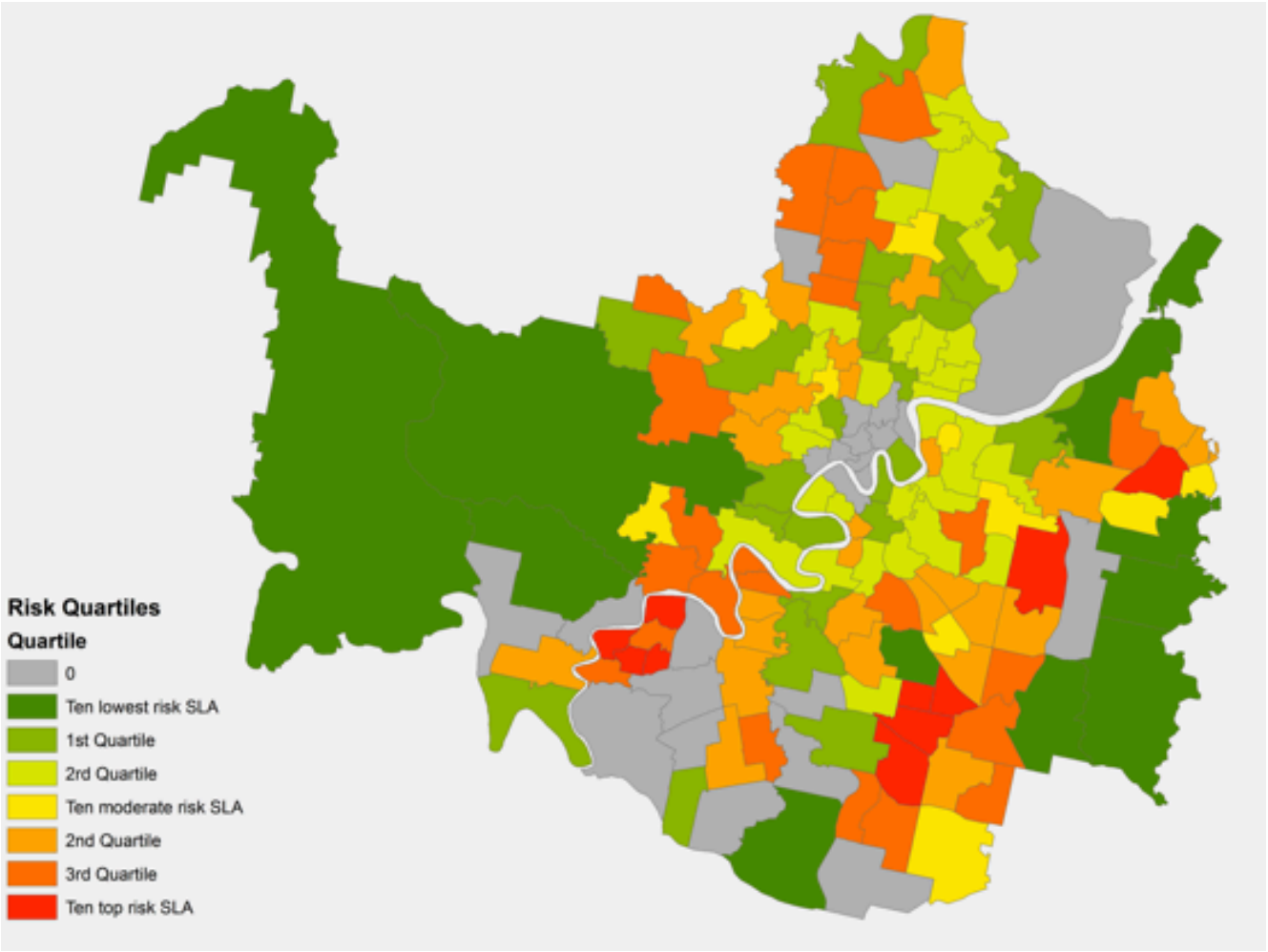


Fig. 3. Brisbane SLAs (Statistical Local Areas) - risk of *Aedes aegypti* establishment

Queensland will be essential to prevent the establishment of invasive vectors and the consequent risk of seasonal transmission of disease into the future.

At the CSIRO, I am currently involved in the Vector Safe Communities initiative where we are seeking solutions that prevent the risk of disease transmission within Australian urban centres. The failure of traditional mosquito control tools around the world has resulted in the rapid spread of invasive disease vectors such as *Ae. aegypti* and *Ae. albopictus*. Since the 1980s, *Ae. albopictus* has spread throughout north America and is now rapidly spreading through Europe. Like *Ae. aegypti*, this mosquito is capable of transmitting dengue, Zika and chikungunya, and as recently as 2005 has invaded the many islands of Torres Strait, just north of the Australian mainland. Not only does *Ae. albopictus* threaten Australia through the tropical regions, it is also being detected at major ports around the country, with two detections at the Brisbane port in 2018 alone. Previous research suggests that this species is capable of establishing and spreading through all major Australian cities and these findings should be a cause for concern.

Likewise, *Ae. aegypti* is constantly being detected at major ports, but it is also important to understand the risk of populations established in towns just 150km north of Brisbane. It is these populations along major transport corridors that could provide immigrants for potential future invasions into Brisbane. The genetic connectivity of these populations is something I am currently studying with the help of Gordana Rasic at QIMRB. Over the previous summer, and with the assistance of environmental health officers from the North

Burnett, South Burnett, Bundaberg and Gympie regional councils and Queensland Health Public Health Units, we are hoping to apply next generation DNA sequencing to determine how long these populations have been in the region. We can examine relationships between individuals within a town, between towns and with larger mosquito populations in northern Queensland. For example, the population in Gin Gin was not detected in entomological surveys in 1996 and 2006, however a population was found in 2011. We want to know if this establishment was a recent invasion and whether there is a risk that these mosquito populations may spread further south.

But what are we to do if an established population is detected in a large urban centre? Traditional tools using chemical control are expensive, do not scale well over large areas and there are concerns for the health of communities and chemical resistance forming in mosquito populations. There is an opportunity here for the development of new tools to combat the threat of disease transmission. Already the World Mosquito Program (formerly Eliminate Dengue) has used *Ae. aegypti* infected with a strain of *Wolbachia* to protect major cities in northern Queensland (Hoffmann *et al*., 2011). However, this method is only useful within the core distribution of

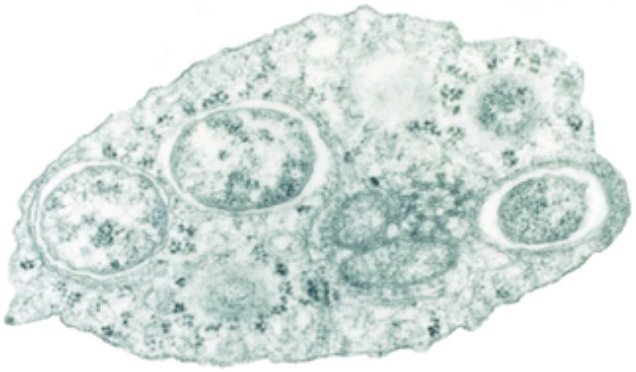


Fig. 4. Transmission electron micrograph of *Wolbachia* within an insect cell. Photo credit: Scott O'Neill, Wikipedia

the species, where conditions are ideal and populations are large. To combat the threat of incursions into new areas, the CSIRO with the help of collaborators at James Cook University, QIMR Berghofer, the University of Queensland and Verily (the health sciences arm of Google's parent company Alphabet), are looking to test the use of *Wolbachia* infected males as a sterile insect technology in Innisfail, North Queensland.

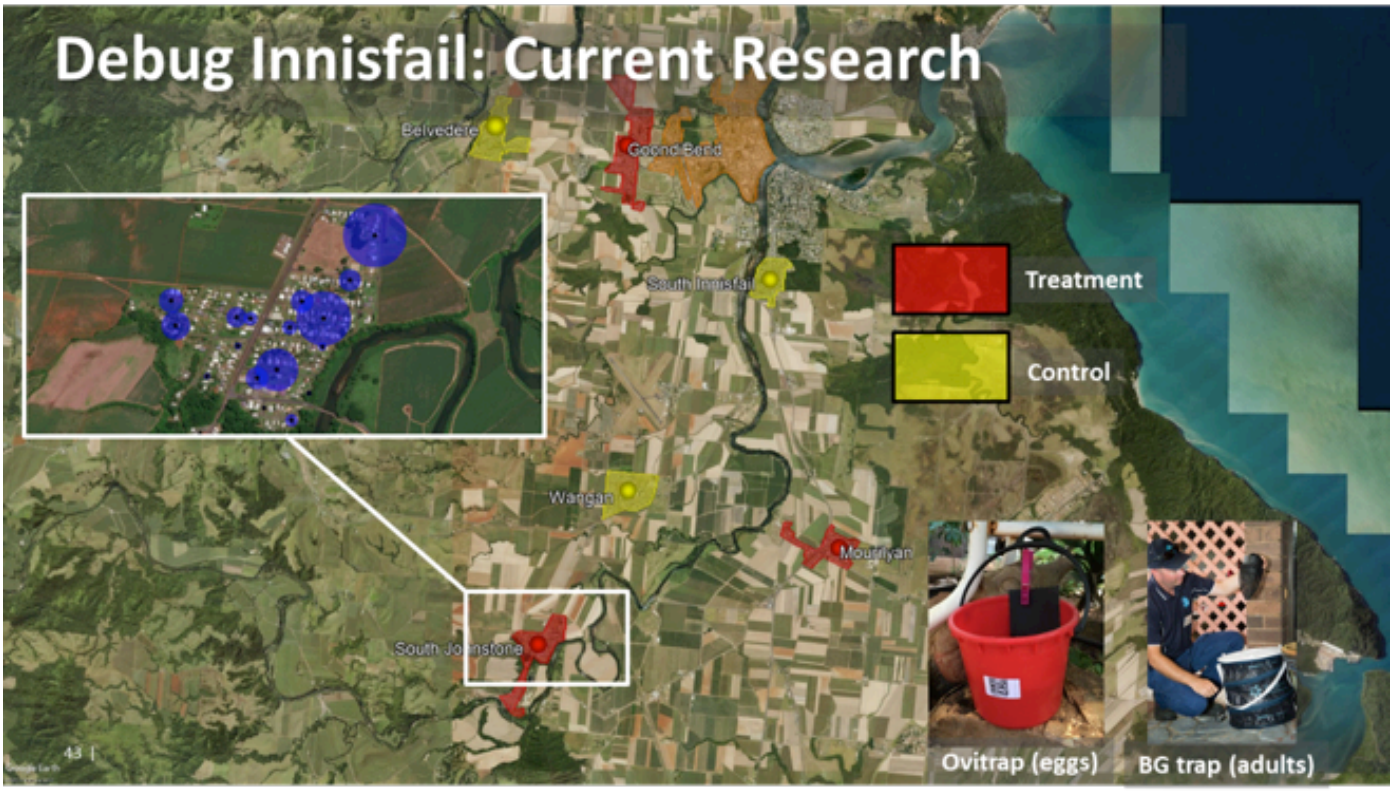
The sterile insect technique can be applied in many ways: using radiation, genetic modification or male only releases of *Wolbachia*. We are currently employing the *Wolbachia* strategy, where males are released across urban landscapes to seek out unmated females. Due to a complex process called

Fig. 5. Mosquito rearing facilities.

cytoplasmic incompatibility, the sperm of males infected with *Wolbachia* (Fig. 4) are stored by females (which only mate once) and from that time on the females only lay eggs that do not hatch (O'Neill *et al*., 1992). Over time, and with the continued releases of males, the population becomes suppressed and this theoretically prevents disease transmission (Dyck et al., 2006). The key to the success of this methodology is the quality of sex separation, and ensuring that no females with *Wolbachia* are released into the landscape (Alphey *et al*., 2010). It is here that Verily provide sex-sorting technology that has unmatched fidelity in its ability to separate males from females (Fig. 5). Ultimately, the goal is to release enough males to exhaust the natural egg bank in the landscape and eventually eliminate entire populations of this invasive species. It is important that I point out that this is an invasive species, not naturally found outside of Africa. This species does not form a large part of the food chain in urban environments and this is because it is highly adapted to human environments. It is here where they can avoid predators by utilising artificial habitats. Populations of *Ae. aegypti* do not exist in high abundance when compared with the many other mosquito species found in tropical regions.

Fig. 6. Above: Debriefing the public in Innisfail. Below: areas of treatment and control sites in Innisfail region.

Debug Innisfail, the project in North Queensland is a culmination of a number of years of research in the region (CSIRO, 2018). It is here on the Cassowary Coast that we have studied and modelled the local *Ae. aegypti* population to ensure we understand the ins and outs of the technology before beginning releases. Working closely with communities is essential to the success of the technology and maintaining consent is one of the most important aspects of our work. Throughout the project our communications and leadership team, including



Nigel Beebe and Scott Ritchie, have ensured that the community are engaged and form part of the decision making process (Fig. 6). The Project Advisory Group, made up of prominent members of the community and government, act as a vehicle for communications to and from the local community. This important relationship ensures that we are providing adequate education while not negatively impacting on business or other local interests. No one wants a face full of male mosquitoes while having their morning coffee!

We have been delivering males into three treatment landscapes for over 18 weeks now and with only two weeks of releases to go, I can say that we are very happy with the results we are observing. We are measuring a reduction in the number of *Ae. aegypti* females in treatments when compared to controls. There has been a significant contribution to this project by a number of parties, so expect to see some exciting science being published in the months ahead. Looking to the future, we are hoping to apply this technology at larger scales to protect vulnerable populations across the Indo-Pacific. This will only be possible if we continue to develop our digital systems to enhance the efficiency of mosquito rearing, trapping and delivery into the landscape. It is an exciting time and may provide an opportunity to apply machine learning and adaptive management techniques to determine and optimize the most efficient way to apply these processes at scale.

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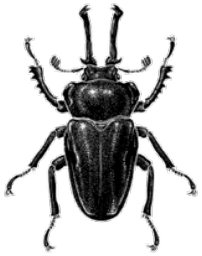
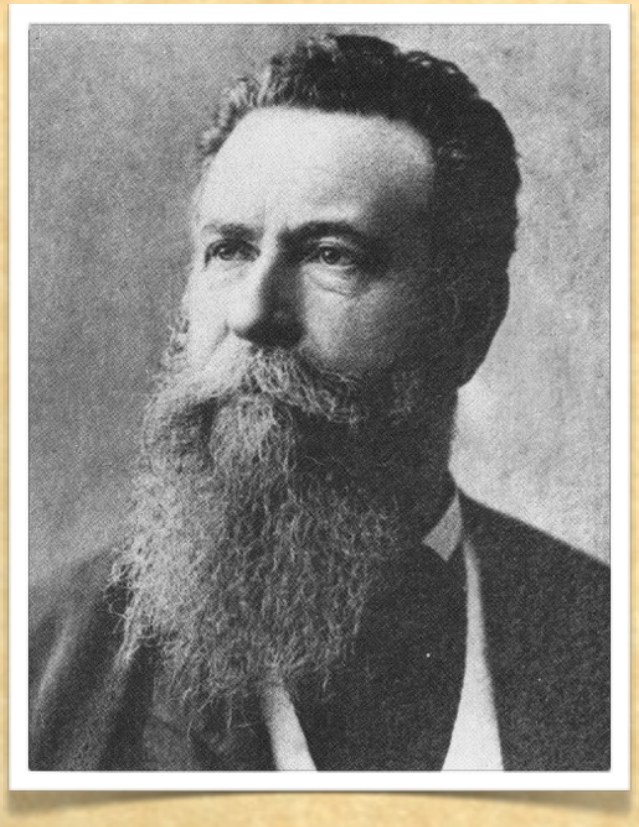


The History Corner...



Joseph BANCROFT (1836-1894)

Born Manchester, England. Studied medicine at Manchester and St Andrews, graduating with awards. Early interest in geology and natural history. Migrated to Brisbane in 1865 settling on a small farm on Enoggera Creek he named “Kelvin Grove”. Practised medicine and carried out experiments on disease, crops and plant pharmacology. In 1866 and 1884 published on ticks and tick blindness and paralysis; in 1869 on coccoids. In 1886 discovered the adult human parasite, *Wucheraria bancrofti,* agent of elephantiasis, named in his honour. Experimented unsuccessfully with the mosquito, *Aedes vigilax*, as its possible vector. In 1877 reported on insect pests of newly established sugar plantations. A prominent scientific leader in early Brisbane and served on many government committees including the first Board of the Queensland Museum. Father of Thomas Bancroft and grandfather of Josephine Mackerras (née Bancroft).

Biography: Pearn, J. & Powell, L. (eds) 1991. *The Bancroft Tradition.* Amphion Press, University of Qld, Brisbane, 268 pp.

Tomato potato psyllid

Bactericera cockerelli

'Category 3' emergency plant pest

Origin: USA – Great Plains region of USA

Adult size: 3 mm long

Attacks: Solanaceous plants, including: potatoes, tomatoes, capsicum, chilli, goji berry, and eggplant

Special ability: Vectors Zebra chip bacterium, *Candidatus* Liberibacter solanacearum

Is it in Australia?

Yes. It was detected in Western Australia in February 2017.

Is it in Queensland?

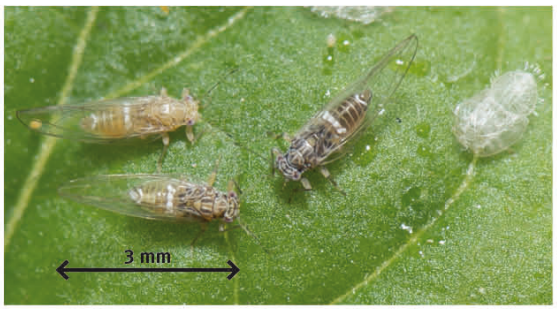
No. Queensland remains free of this pest.

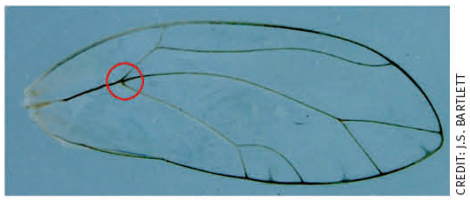
Where can it be found?

USA, Canada, Central America, and New Zealand

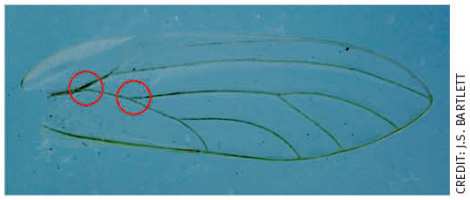
What does it do?

It's a sap sucker! But the most damage comes from its capacity to vector the zebra chip bacterium, *Candidatus* Liberibacter solanacearum. This disease causes yield loss and damage to host crops from the family Solanaceae including potatoes, tomatoes, capsicum, chilli, goji berry, and eggplant.





TPP wing showing trifurcation – Suspicious



Non-triozid wing without trifurcation

What to look for?

Small insects under leaves that jump when disturbed; severe wilting; yellowing and curling of leaf margins; or white sugar-like excretions. Adults are 3 mm long and brownish with white/yellowish markings on the thorax and a broad white band on the abdomen. The tomato potato psyllid (TPP) has trifurcated wing venation, whereas non-triozid psylloids do not (see pictures). Nymphs are yellowish-green to orange and scale-like in appearance. Many psylloids look alike, so accurate identification requires specialist examination.

Produced by the Plant Biosecurity Laboratory (Entomology)

If you think you've found TPP, call the Exotic Plant Pest Hotline: **1800 084 881**

daf.qld.gov.au

Queensland Government

CS8279 05/18

Entomology News

from Queensland and beyond...

Moth antennal scales help to concentrate pheremones

To find a mate, male moths must use their antennae to detect female pheromones. This presents a challenge as there are so many competing smells in an environment. Some of the larger moths have feathery antennae with an increased surface area to support more sensilla and improve the chance of picking up a pheremone scent. However, a majority of moths, especially the smaller ones have only simple filamentous antennae. A team of researchers led by Dr Mark Elgar at the University of Melbourne have taken a closer look at the antennae of the tiny moths in the Family Heliozelidae using scanning electron microscopy. They have found that these small moths have intricate scale arrangements on their antennae to aid with pheremone detection. Using computational fluid dynamics models, they were able to determine that the arrangement and angle of the scales actually concentrated nanoparticles, such as pheremones, and deflected microparticles, such as dust. To read more about their research see:

Wang Q, Shang Y, Hilton D, Inthavong K, Zhang D, Elgar M. 2018. Antennal scales improve signal detection efficiency in moths. Proceedings of the Royal Society Biology 285:20172832.

http://rspb.royalsocietypublishing.org/content/285/1874/20172832

https://pursuit.unimelb.edu.au/articles/it-s-not-just-antenna-size-but-scales-that-matter-for-lonely-male-moths

Read about women in entomology!

An article in a recent edition of Australian Geographic interviews five women entomologists about their interests, inspirations and challenges.

Kate Umbers from Western Sydney University, Georgia Binns and Lizzie Lowe from Macquarie University, Erin Fagan-Jeffries from Adelaide University and Perry Beasley-Hall from University of Sydney each had different entomological interests, but all agreed, it was important to engage with the community and inspire young people to learn more about insects. Georgia Binns was quoted as saying "You really just need an enthusiastic teacher or mentor to instill their passion into you... but we need to keep that enthusiastic momentum going for future generations of women in science and entomology."

To read the full article see:

http://www.australiangeographic.com.au/topics/science-environment/2018/04/australian-women-in-entomology

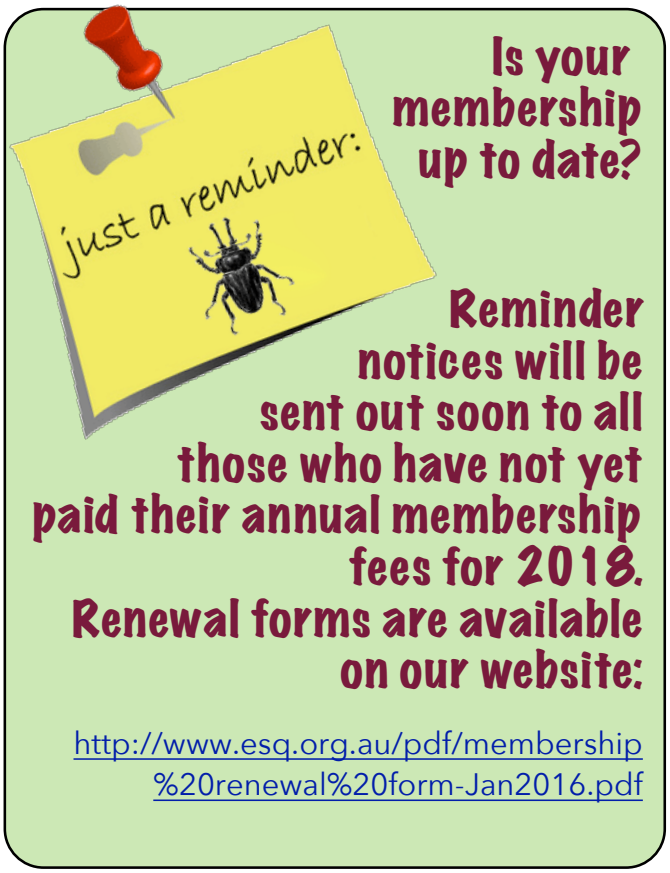
Fourteen new spiders, two of which are threatened, described for Western Australia

Mike Rix (Queensland Museum) has been leading a project to describe unnamed specimens of trapdoor spiders (Idiopidae) in collections. Working together with researchers from the Western Australian Musuem, South Australian Museum and the University of Adelaide, they have described 14 new species of idiopids. Many of these spiders live in

remnant pockets of semi-arid woodlands which are threatened habitats. Having the spiders named is important for Environmental Impact Assessments. Of the 14 newly described species, two have already been added to the threatened species list. To read more about these interesting spiders and their unique defensive behaviour see:

http://www.australiangeographic.com.au/news/2018/05/fourteen-new-trapdoor-spider-species-described-in-wa

Rix MG, Raven RJ, Main BY, Harrison SE, Austin AD, Cooper SJB, Harvey MS. 2017. Invertebrate Systematics 31(5): 566-634 https://doi.org/10.1071/IS16065

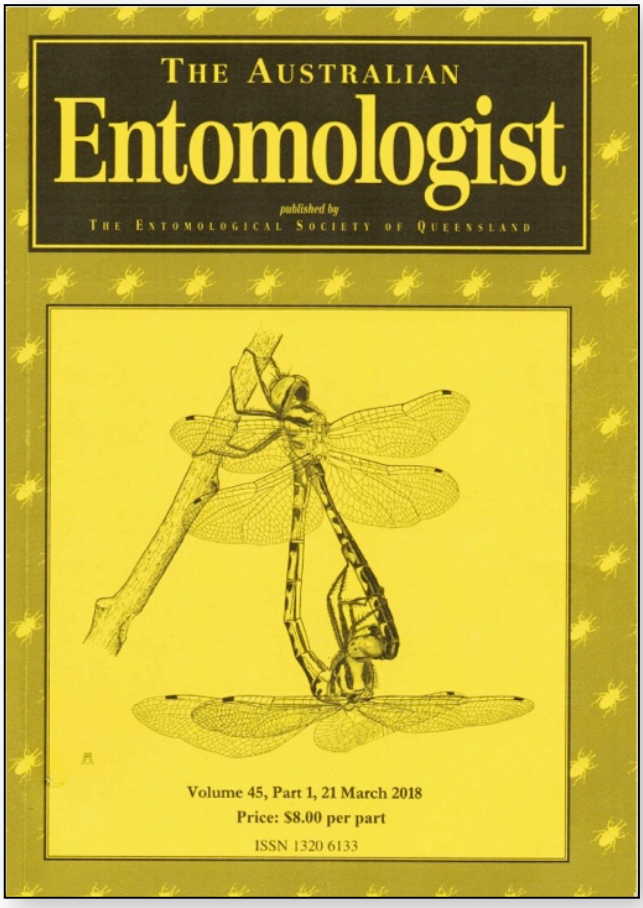


The Australian Entomologist AN INVITATION TO SUBSCRIBE

"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.

Our regular cover artist is journal subscriber and ESQ member Dr Albert Orr who lives at Currimundi. He has produced a very inventive design of a pair of dragonflies in the mating position for the 2018 issue.

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, see our website: www.esq.org.au/publications.html



Territorial Integrity in a north Queensland Katydid

by David Rentz

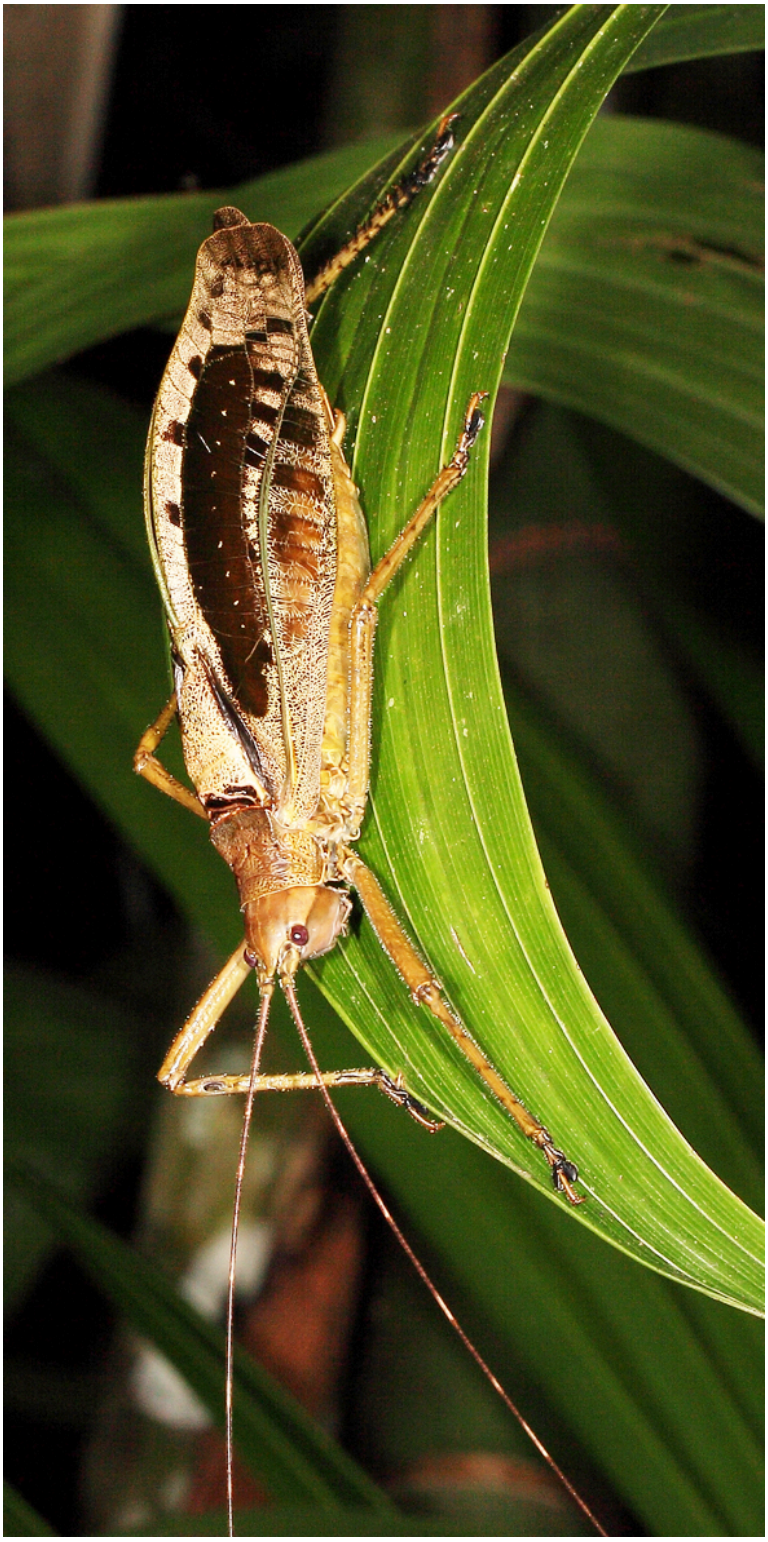


Fig. 1. Adult male *Segestidea queenslandica*. Note difference in the appearance of the tegmina from those of the female.

The Queensland Palm Katydid, *Segestidea queenslandica* Rentz, Su & Ueshima, is an outstanding tropical insect in several respects. It is the sole known Australian representative of a genus comprising some 11 species, mostly from New Guinea and the Pacific http://orthoptera.speciesfile.org/Common/basic/Taxa.aspx?TaxonNameID=1135851. Several species cause depredation to palms with oil palms and coconut palms sustaining considerable damage due to the feeding of the katydids. *Segestidea queenslandica* feeds solely on palm leaves and generally causes no damage. It is a large katydid with males measuring approximately 50.0 mm in length and females measuring 56.0-60.0 mm in body length (Rentz *et al*. 2006). The species is known from localities in the Cooktown vicinity south to Garradunga near Innisfail and west to the Atherton Tableland, Qld. Females are among the largest of the Australian katydids, competing with those of *Siliquofera grandis* (Blanchard) from Iron Range, Qld in this respect.

One interesting biological attribute of this species is that females are facultatively parthenogenetic. Unmated females will lay eggs that hatch, all the nymphs females. Males (Fig. 1) are rare in nature. At the time of the original description, only one male was known. Each year a few of the loudly-calling males are heard around Kuranda. Females (Fig. 2) are much more common and most probably never encounter a male in their lifetime. Males inevitably sing from Wait-a-while or Lawyer palms, *Calamus* spp. but they can occur on introduced palms as well. They sing from perches in their host palms from 1.5-4.0 m from the ground. The calling song of the Palm Katydid

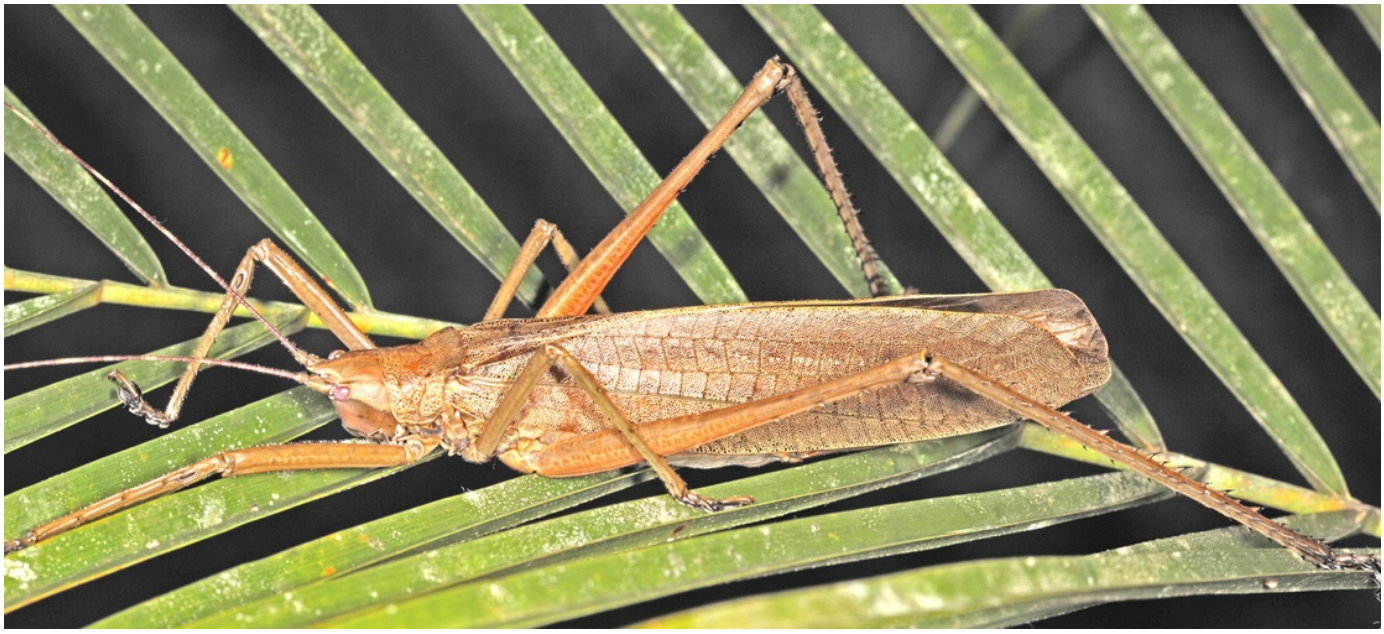


Fig. 2. Adult female *Segestidea queenslandica*.

is incredibly loud to human ears. It can carry for more than 100 m through the undergrowth of the rainforest. Singing males are easy to sight from their host plants. In the past I have noted the integrity of a given male to its stridulatory perch. This year I watched and heard a single male from a single site from 7 December 2017 to 15 May 2018. Each night the male commenced singing after dark and this continued incessantly until just before dawn. This male ceased calling after the weather turned cool and has not been heard since. It seems incredible that these large katydids survive the sharp eyes of the Black Butcherbird, *Melloria quoyi*. Each morning these predatory birds can be observed carefully examining vegetation and the sides of houses where lights may have attracted large insects such as katydids and moths. House Geckos that have not found a secure spot to spend the daylight hours are fair game for the birds. Fortunately for the Palm Katydids, they are not attracted to lights. They spend the day legs akimbo on palm fronds apparently escaping the search image of the butcherbirds. Young nymphs are speckled greyish white resembling bird droppings in this respect. More advanced nymphs are mottled brown matching the colour of dead palm fronds where they spend the daylight hours (Fig. 3). Large females can frequently

Fig. 3. Mid-instar nymph abroad at night on a palm frond.

be seen during the day legs akimbo on palm fronds or concealed on dead fronds. Late in the season, females descend their perches to oviposit in the ground. At this time they can be found on the ground after dark. In years when Cane Toads are abundant, the katydids are probably eaten by larger toads as they attempt to oviposit.

Over the years neighbours have complained about "singing crickets" that interfered with their night's sleep. The uninterrupted "song" for hours and hours is a bit too much to bear for some folks. I try to tell them how lucky they are to have such an unusual insect outside in the palm adjacent to the bedroom. But they are usually not convinced. One neighbour sought out the katydid and from a ladder gave it a dose of insect spray!

REFERENCE

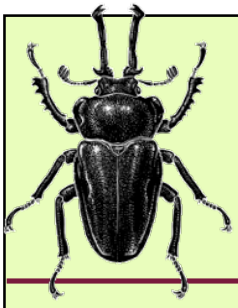
Rentz, D. C. F., Su, Y. N., Ueshima, N. 2006. Studies in Australian Tettigoniidae: The Mecopodine Katydids Part 2 (Orthoptera: Tettigoniidae; Mecopodinae; Sexavaini) Queensland Palm Katydid. *Transactions of the American Entomological Society*, 132(3): 229-241.

What about those termites...

Last month we posted a photo from the Queensland Museum that showed a number of termites parading around a galvanised bolt. Professor Stephen Cameron from Purdue University sent us some interesting information about this behaviour. He says "they are Schedorhinotermes, and like many Rhinotermitids, they use trail-following pheromones which the lead termites lay down. The rest of the termites progressively add to the pheromone trail, resulting in these invisible 'rails' that they'll walk in. If you put them in a container, they routinely do this 'form a circle' behaviour because they randomly wander out to the side, hit the edge and can't climb, so run around the container until it just becomes one big circle. This takes some time to form as the initial movement is pretty random, but after a while they are about as closely packed as in the photo (below). They like other termites to be nearby, too.

So with this lot, perhaps rather than walk down the sides of the timber, they kept turning to follow the edges which resulted in the circle. What is odd is that they seem to be out in the open quite merrily – Schedorhinotermid workers are pretty useless and a good snack for just about any mid-sized ant, and the soldiers are less than useless in the open like that. I am surprised they had the time to form a parade before an enterprising *Iridomyrmex* ant killed them all. They must have fallen onto that timber from somewhere else and then didn't know how to get home, with random questing behavior eventually resulting in the circular congo-line. I have never seen anything like that out in the open though."

Photo from Mr. Michael Nardella of Wakerley, QLD.

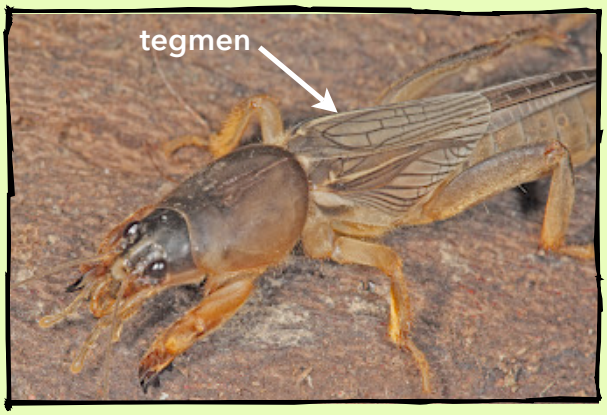


S-t-r-e-t-c-h your Ento knowledge

Answer to last month's mystery photo:

The mystery photo is the front leg of a mole cricket, *Gryllotalpa monanka* in the Family Gryllotalpidae. Well done to Roger Farrow, Bob Miller, Kit Prendergast, Dave Schlipalius and Penny Mills who all guessed correctly! Thank you to David Rentz for contributing the photo and sharing a bit about them from his blogpost. (http://bunyipco.blogspot.com.au/search?q=mole+cricket)

Australia has a great diversity of Mole Crickets. Most are in one genus, *Gryllotalpa*. Over 20 species are known. They are distributed across the continent even in the most arid areas where they are concentrated around sinks and watercourses. The forelegs are highly modified with trowel-like spines that shift the dirt as the cricket moves through the soil. Mole Cricket species are tough to identify. The calling song of the male is the distinctive feature. Some species use a burrow chamber as an amplifier and the singing male perches at the burrow entrance and rotates his body 360 degrees as he produces his song. That is why it is often so difficult to locate a singing male. The sound seems to come from everywhere or nowhere! And most species sing only for a few minutes and that is at dusk when visibility is not good. They cease calling at the slightest disturbance.



Mole Cricket - photo credit: David Rentz

Word of the month: tegmen

Noun. (Latin, *tegmen* = covering. PL, Tegmina.) A covering or, in the case of Orthoptera, Blattodea, and some Hemiptera, a hardened, leathery forewing.

Definition from:
Gordh G & Headrick D. 2011.
A dictionary of entomology. CSIRO Publishing.

This month's mystery photo:

Any guesses?

If you think you know what it is, send me an email!

--the Editor
k.ebert@uq.edu.au

Have you got a photo that could be used for the mystery photo challenge?

Announcements

Australian Entomological Society 49th AGM and Scientific Conference – 2018: Call for Abstracts

You are invited to attend the 49th Australian Entomological Society AGM and Scientific Conference. The conference will be held at the Alice Springs Convention Centre in Alice Springs, Northern Territory, from Sunday 23rd to Wednesday 26th September, 2018. This year the conference theme is *insects as the centre of our world*. With this theme we are encouraging you to focus on the importance of insects to our natural ecosystems, agribusiness, health and land management whilst also appreciating the cultural, ecological and entomological character of central Australia. Our symposia will reflect this aim by including topics with a local focus (including desert ecology, entomophagy) in addition to presentations on recent entomological advances. The *yeperenye* caterpillar (*Hyles livornicoides*, Lepidoptera: Sphingidae) is a major creative ancestor of Alice Springs and it is this caterpillar that we have chosen for our conference logo.

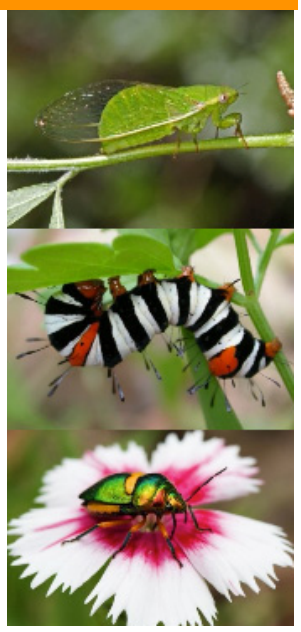
Please note that symposium and abstracts are not restricted to just the conference theme.
Abstracts are required for all presentations, including posters.
Deadline for submission of abstract: 30 July 2018
(Notification of acceptance of abstracts will be 14 August 2018)

For registration and more information see: https://www.aesconferences.com.au

BUTTERFLY AND OTHER INVERTEBRATES CLUB

$250 cash prize & more

Invertebrate Photo Competition



Calling all Year 9-12s

Capture your best video or snapshot and enter the Butterfly and Other Invertebrate Club photo competition for your chance to win some great prizes. First prize includes $250 cash, a book of your choice, one year membership to BOIC and a complimentary full day visit to the award-winning **Toohey Forest Environmental Education Centre** for you and your class.

To Enter:

Email your authentic invertebrate photo with details including location and date, and description of the subject (max.500 words) by 26 June 2018.

Submit your entry to principal@toohforeeec.eq.edu.au

The BOIC, in conjunction with the Toohey Forest Environmental Education Centre, is sponsoring the competition to encourage interest in invertebrates by young people.

Meetings & conferences

8th International Conference on the Biology of Butterflies
June 11–14, 2018
Bangalore, INDIA
https://in.eregnow.com/ticketing/register/biologyofbutterflies

1st Australian Native Bee Conference
July 1–2, 2018
Gold Coast, Queensland, AUSTRALIA
https://www.eventbrite.com.au/e/the-first-australian-native-bee-conference-tickets-41204382417

XI European Congress of Entomology
2-6 July 2018
Naples, Italy
www.ece2018.com

International Union for the Study of Social Insects
5-10 August 2018
Guarujá SP, Brazil
http://www.iussi2018.com

EVOLUTION 2018
Joint Congress between the American Society of Naturalists (ASN), The Society of Systematic Biologists (SSB), the Society for the Study of Evolution (SSE) and the European Society for Evolutionary Biology (ESEB)
August 19–22, 2018
Montpellier, FRANCE
http://evolutionmontpellier2018.org/

10th International Workshop on the Molecular Biology and genetics of the Lepidoptera
19-25 August 2018
Orthodox Academy of Crete
Kolympari, Crete, Greece
https://web.uri.edu/lepidoptera/

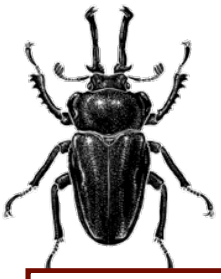
XXVII Brazilian Congress of Entomology and XV Latin American Congress of Entomology
September 2–6, 2018
Gramados, BRAZIL
https://www.cbe2018.com.br/pt/

XV International Congress of Acarology
2-8 September 2018
Antalya, Turkey
http://www.acarology.org/ica/ica2018/index.html

Australian Entomological Society (AES) 49th AGM and Scientific Conference
September 23–26, 2018
Alice Springs, Northern Territory, Australia
https://www.austentsoc.org.au/Web/Events/49th_AGM_and_Scientific_Conference.aspx

Joint Entomology Conference 2018 (Ent. Soc. of America (ESA), Ent. Soc. of Canada (ESC) and Ent. Society of British Columbia (ESBC))
November 11–14, 2018
Vancouver, CANADA
https://www.entsoc.org/events/annual-meeting

9th International Congress of Dipterology
25-30 November 2018
Windhoek, Namibia
https://icd9.co.za/



Diary Dates for 2018

Meetings held on the second Tuesday of the respective month

MARCH 13	Tim Heard	AGM and Presidential Address: "*Stingless Bees, their journey from obscurity to insect ambassadors"*
APRIL 10	Andy Walker	*"Exploring the world of insect venoms"*
MAY 8	Brendan Trewin	*"The history of* Aedes aegypti *in Southeast Queensland and novel techniques for its surveillance and control."*
JUNE 13	Notes and Exhibits	Notes & Exhibits
AUGUST 14	Mike Rix	*"Life down under: evolution and conservation of Australia's trap door spiders"*
SEPTEMBER 11	Brian Montgomery	*"Zika Mozzie Seeker - exploring Citizen Science as a tool to monitor invasive and urban mosquitoes"*
OCTOBER 9	TBA	*"TBA"*
NOVEMBER 13	Irene Terry	*"Wacky world of cycads: Thermogenesis, volatiles and pollinator interactions"*
DECEMBER 11	Notes & Exhibits	Notes and Exhibits/Christmas Afternoon Tea

SOCIETY SUBSCRIPTION RATES

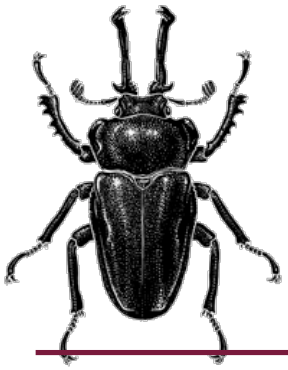
GENERAL	Person who has full membership privileges	**$30pa**
JOINT	Residents in the same household who share a copy of the *News Bulletin*, but each otherwise have full membership privileges.	**$36pa**
STUDENT	Student membership conveys full membership privileges at a reduced rate. **Free the first year**, $18pa subsequent years. 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, June 12th, 2018, 1:00 pm

Notes & Exhibits

Presentations will include short talks on

ITS barcoding in tephritid fruit fly diagnostics, an update on the permit situation, minute fungus beetles, plus more!

Anyone is welcome to present a short talk or exhibit at 'Notes & Exhibits' meetings. We would love to hear about what you have found or learned in your laboratory, backyard, bushwalk or workplace!

Contact Mike Muller if you have something you would like to share at muller36@bigpond.net.au

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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 46, Issue 4 (June/July 2018)

CONTRIBUTIONS WELCOME

Deadline Thursday, July 12th, 2018.

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