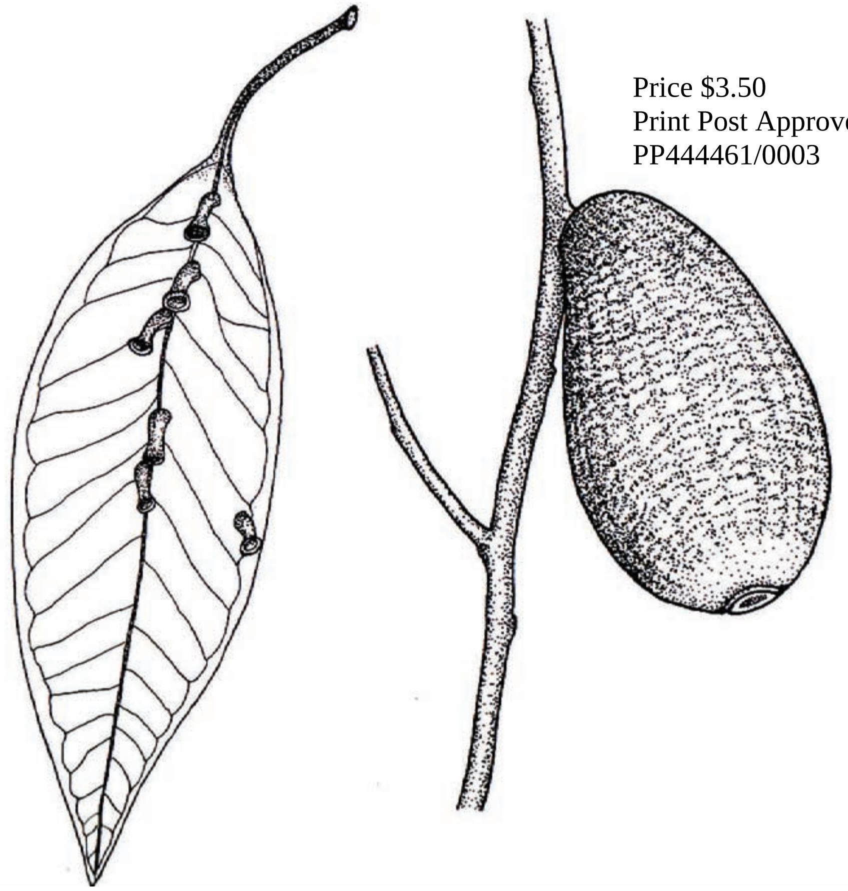
ENTOMOLOGICAL SOCIETY OF QUEENSLAND INC

# NEWS BULLETIN



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Volume 39, Issue 3, May 2011

# THE ENTOMOLOGICAL SOCIETY OF QUEENSLAND

**Internet:** www.esq.org.au **Email:** esq@uqconnect.net
**Address:** PO Box 537, Indooroopilly Qld 4068



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**Front cover illustration**: Galls induced by the scale insect *Apiomorpha conica* (Eriococcidae) on *Eucalyptus obliqua*. Top: tubular galls on leaves induced by males. Bottom: gall induced by female on stem. Original drawing by Penny Gullan.

**ISSN 1037-2989**

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The **ENTOMOLOGICAL SOCIETY OF QUEENSLAND INC.**, 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 Monday of each month (March to June, August to December), or on Tuesday if Monday is a public holiday. 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. It is restricted to the rainforests of northern Queensland.

## Minutes of General Meeting

Held in Meeting Room (Seminar Room 1–ground floor) Ecosciences Precinct, Boggo Rd, Dutton Park, Monday, May 9th 2011.

**Chair:** Lyn Cook

**Attendance:** Justin Bartlett, Lyn Cook, Graham Donnelly, Gio Fichera, Alexandra Glauerdt, Tim Heard, David Holdom, Simon Lawson, Diana Leemon, Lance Maddock, Lacey Mack, Penny Mills, Geoff Monteith, Mike Muller, Kelli O'Neill, Matthew Purcell, Don Sands, Geoff Thompson, Desley Tree, Federica Turco, Peter Twine.

**Visitors:** None

**Apologies**: Ross Kendall, Judy King, Chris Lambkin, Chris Moeseneder, Mark Schultz

**Minutes:** The minutes of the last General Meeting were circulated in News Bulletin Vol. 39, Issue 2, April 2011.
*Motion that the minutes be accepted as a true record was by a show of hands:* accepted

**Business arising**
None.

**Nominations for Membership:**
The following nomination for general membership was received and approved by Council, and was put forward for election:
Alexandra Glauerdt
Elected unanimously.

**General Business:**
Members were reminded that contributions for the June Notes and Exhibits meeting are welcome and contributors should contact Matt Purcell.

Two submissions were received by Council for the Society's Student Award. The prize has been awarded to Rebecca Morley from The University of Queensland for her Honours Research Report entitled "The effect of light on bioluminescence in the glowworm *Arachnocampa flava*".

## Main Business

The Main Business was a presentation by Dr Tim Heard (Research scientist, CSIRO Ecosystem Sciences) entitled "Australian native stingless bees – recent research on a species with a variety of potential commercial applications".

### Australian native stingless bees – recent research on a species with a variety of potential commercial applications

Tim Heard. CSIRO Ecosystem Sciences

**Abstract**

Several species of stingless bees belonging to the genera *Austroplebeia* and *Tetragonula* are native to the northern parts of Australia. These bees are fascinating and ecologically important species and also have a potential role in human economy. First they could be managed for commercial pollination of tropical crops. Second they are producers of honey with gourmet and medicinal properties. Third, they are gaining popularity as "pets" thereby providing contact with nature for increasingly urbanized populations.

**Introduction**

Geoff Monteith rescued a colony of *Tetragonula carbonaria* in his backyard around 1980. Mustering his formidable biological intuition he stumbled upon a technique that has proven to be an excellent way of keeping and propagating colonies of this species and others (Heard 1988). All the work discussed in this talk relies on reliable propagation of hives and owes a debt to Geoff.

Australian species of stingless bees are divided into our endemic *Austroplebeia* and the Indo-Malayan/Australian *Tetragonula*. *Austroplebeia* has links to African stingless bees whereas *Tetragonula* probably migrated from Asia and speciated here. The genus *Trigona* (*sensu lato*) is polyphyletic and so the name is now only used for the American *Trigona* (*sensu stricto*) (Rassmussen and Cameron 2007).

**Stingless beekeeping**

The development of a means of propagation stimulated keeping of stingless bees in Australia. It grew to 250 beekeepers keeping 1400 colonies in 1998 (Heard and Dollin 2000) to 637 beekeepers with more than 5000 colonies in 2010 (M. Halcroft, unpublished data). Most people keep the bees as "pets" for recreational purposes.

**Honey production**

The value of the honey is about ten times that of honey bees, with a wholesale price of $70 per kg. Total national production is probably < 500kg per year. It is a potentially important activity for aboriginal communities. The composition of the honey of the most commonly kept species *T. carbonaria* is typical of stingless bee honey with a high water content, high acidity and unusual sugars (Persano Oddo et al. 2008).

The honey has been shown to have good antimicrobial properties against *Staphylocccus aureus* using the agar well diffusion assay (Irish et al, 2008). This was confirmed against other microbes and using a variety of assays (Boorn et al, 2010). Unlike normal medicinal honey the activity seems to be independent of the botanical source of the nectar. We suggest that it may be contact with the resin in the storage pots that leads to this activity.

**Crop pollination**

Insect pollination in Australia is threatened by pesticides, loss of remnant vegetation, invasion of small hive beetle, invasion of *Apis cerana*, and potential invasion of the honeybee varroa mite (Cunningham et al 2002). Managing the use of stingless bees and other natives may provide part of the response to these threats.

Many characteristics of stingless bees resemble honey bees (Heard 1999) including:

- Polylecty and adaptability
- Floral constancy
- Domestication
- Perennial colonies
- Large food reserves are stored in nests
  - allowing colonies to survive long periods of low food availability.
  - workers will collect floral resources beyond immediate needs
- Possibility of in-hive pollen transfer
- Forager recruitment

Unlike honey bees, stingless bees have the following advantages:

- Generally harmless to humans and domesticated animals.
- Able to forage effectively in glasshouses.
- Propagation of colonies contributes to preservation of biodiversity by conserving populations of species which may otherwise decline due to human disruption of ecosystems.
- Colonies are unable to abscond as the old queen is flightless.
- They are resistant to the diseases and parasites of honey bees.
- Short flight ranges (typically 500 m) keeps them in crops.

Disadvantages of stingless bees for crop pollination include:

- Poor level of domestication technology for most species.
- Some species are unable to be domesticated due to specific nesting requirements
- Lack of availability of large numbers of hives.
- Slow colony growth rates compared to honey bees
- Limited to warmer part of the globe
- Some species damage leaves in search of resin (not Australian species)
- Some species are territorial and fight when placed in close proximity

An interesting new study shows how *T. carbonaria* can adjust is foraging preferences depending on the temperature of the nectar, possibly preadapting this species to a warmer climate (Norgate et al, 2010).

Some crops for which stingless bees make an important contribution to pollination in Australia include macadamia, mango, avocado, strawberry, rambutan and blueberry. Preservation of native habitat in the vicinity of orchards can provide stingless bees which provide a pollination service to the orchard (Heard and Exley 1994). But many orchards are in heavily cleared areas where the bees will need to be re-introduced in managed hives.

A challenge to using *Tetragonula* spp. bees in orchards is their aggressive behaviour between colonies. Molecular analysis of eight naturally-occurring fights showed they almost always comprise just two colonies, one of which is located within 2 m of the fight. Fighting swarms were experimentally triggered by manipulating colonies so that they received non-nestmate workers. A fighting swarm was initiated in all four colonies of the two manipulated colony pairs. Swarms were visually estimated to reach sizes of 4000, 4000, 1500 and 2500 individuals for each of the four colonies respectively. We concluded that defensive swarms in *T. carbonaria* arise primarily as a defence against nest usurpation by conspecifics and probably also heterospecifics (Gloag et al, 2008).

We have come a long way in 20 years in understanding these insects and utilizing them for honey production, pollination and as pets. Future research will include the role of the environment for hive health and growth, the role of these bees in the pollination of specific crops and managing fighting swarms.

**References**

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Vote of Thanks: Penny Mills
The Chair closed the meeting at 2.05pm

**Top:** A well protected hive of *T. carbonaria* positioned in a lychee orchard; **Bottom left:** A hive of *T. carbonaria*, the top section is laden with honey pots.

## Main Business from April General Meeting

### The small hive beetle – small beetle, big problem

Diana Leemon, Agri-science Qld, DEEDI

*Aethina tumida*, the Small Hive Beetle (SHB) is a native scavenger of bee hives in South Africa where it is regarded as a minor pest. The SHB was first reported in Florida in 1998 after its accidental introduction to the United States of America. It soon spread to 26 states and is now a major pest of European honey bees in the warmer states of the US. The SHB was detected in Australia in 2002 in an apiary at Richmond, New South Wales. From there it spread to Queensland with the movement of infested hives. It has now spread throughout Eastern Australia from Mareeba in the north to the Melbourne CBD in the south and has also been recorded in hives in the far North West of Western Australia. The return of wet summers in 2009 confirmed the ugly potential of this pest in Queensland (Fig. 1). Surveys of Qld beekeepers have provided an estimate of just over $2 million in losses attributable to the SHB in each of the summers of 2008-2009 and 2009-2010. These figures only include the actual beehive losses recorded by the survey respondents. No estimate was made for the 50% of registered beekeepers who did not return their forms or for the reported losses of nucleus hives. It is considered that these high losses are directly related to the effect of warm temperatures and high moisture on the beetle life cycle allowing a rapid increase in beetle numbers.

Adult SHB live mainly in hives feeding on bee eggs, pollen and rubbish, however females have their highest reproductive success when they feed on pollen. Adult SHB fly around dusk to locate hives when newly emerged or to move between hives when older. Although it is believed that the older beetles are less likely to move between hives and are repelled by light. The bees will chase beetles attempting to enter the hive and when inside the hive, however, the behaviour of the European honey bee is not aggressive enough to hold back the SHB. The SHB's aversion to light and an inclination of some bees to chase the beetles are two behaviours that are exploited in the design of traps developed by apiarists to combat SHB in their hives.

**Figure 1**: Damage to hives caused by *Aethina tumida*: hive destroyed by larvae (top); hundreds of larvae on the bottom of a brood box (middle); larvae crawling over 'slimed-up' frame of honeycomb (bottom).

The small hive beetle has a typical Coleopteran life cycle (Fig. 2). Female adults will mate and begin laying eggs within 2–4 days of feeding on protein such as pollen. The eggs are small (~ 1.2 mm) and white and are laid out of the way of bees in the hive. Females can lay between 1,000 and 2,000 eggs on their lifetime. Under ideal conditions eggs hatch and larvae, which are the destructive stage in hives, begin to feed on bee brood (preferred), pollen and honey. The rapacious SHB larvae ruin combs and honey by promoting the fermentation of honey by the yeast *Kodamaea ohmeri* that they appear to vector. A heavy infestation of larvae will cause the bees to abscond from the hive leading to further breeding by SHB and the total ruination of the hive by thousands of larvae feeding in a “slimed up” hive (Fig. 1). The time to larval maturity is dependent on both temperature and food.

Mature larvae exit the hive to pupate in the soil. At this wandering stage they are vulnerable to both weather and predation (at last, a use for the maligned cane toad; they love a few tasty SHB larvae). Most SHB larvae will burrow within 90 cm of the hive entrance, but have been known to travel up to 200 m to find a suitable substrate in which to pupate. Both soil moisture and temperature are critical for pupation success. Hence with warm temperatures and high moisture the SHB life cycle speeds up leading to a rapid increase in beetle numbers.

Current control options for this pest include a recently released refuge trap utilising fipronil for in-hive use (Apithor by Ensystex), permethrin for the treatment of soil around the hives and a range of in-hive trapping systems that utilise either oil or diatomaceous earth. Many of the in-hive trapping systems have been developed by different beekeepers and are not available commercially. The capture efficiency of the in-hive tapping systems varies and many are

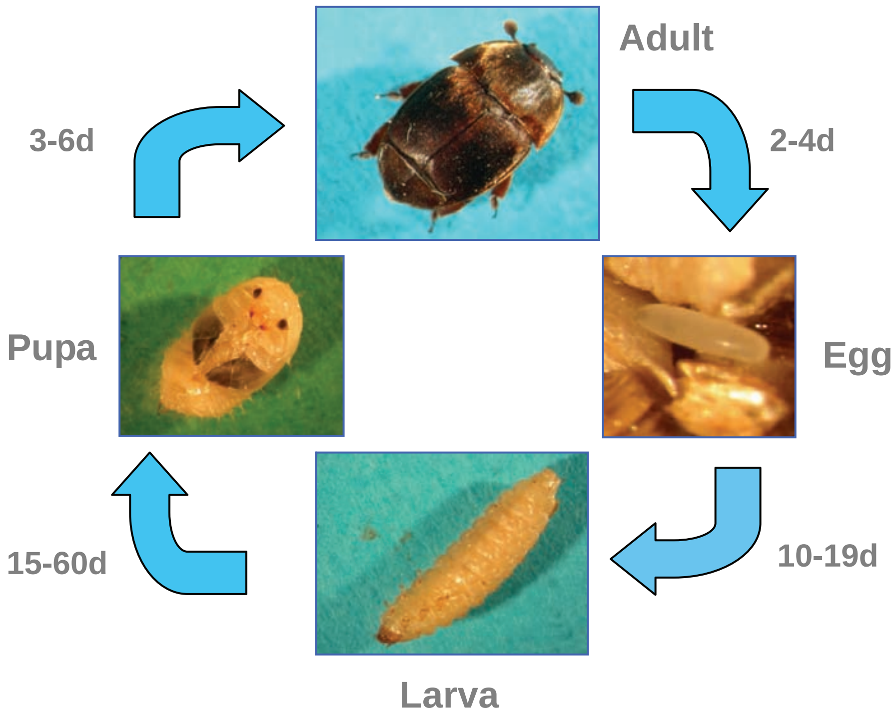


**Figure 2**: Life cycle of *Aethina tumida*, showing the range of number of days taken for each stage under optimal conditions.

dependent on the attractiveness and number of traps as well as the aggressiveness of the bee colony towards the beetles. There is a critical need for more control options, preferably non-chemical.

Over the last four years we in DEEDI have been carrying out research into a range of non-chemical approaches to SHB control. This research has focussed on the use of entomopathogenic fungi against larval and adult SHB, the effect of diatomaceous earth on adult SHB and the feasibility of an out of hive attractant trap based on the volatiles produced by yeasts associated with the SHB.

Endemic isolates of the fungi *Metarhizium anisopliae* and *Beauveria bassiana* have been screened against both adult and larval SHB (Fig. 3). A number of *M. anisopliae* isolates were found to be highly virulent towards larvae. Three selected isolates were developed for field testing and trials conducted over the last two summers confirmed the potential of these isolates for infecting and killing larvae exiting the hives into the surrounding soil. Isolates of *B. bassiana* proved the most virulent to adult SHB. In laboratory tests *B. bassiana* spores added to beetle refuges killed 100% of beetles within 7 days. Further work is required to investigate how *B. bassiana* spores can by used inside the hive to control SHB.

An evaluation of diatomaceous earth (DE) has shown it to be very effective in killing SHB lured into refuge traps. Electron microscopy studies show that the DE particles (1-20μm) coat the sensilla, antennae and mouthparts of beetles. Further studies are continuing to quantify the effect of high humidity on the efficacy of DE and gain some understanding into to mechanism by which DE kills SHB.

Overseas researchers identified the yeast *Kodamaea ohmeri* which is associated with the SHB. This yeast produces volatiles that are highly attractive to adult SHB. Recent investigations have focussed on looking for this yeast in Australian SHB and investigating its volatiles as a prelude to identifying chemicals that could be utilised for an attractant trap. The results have been quite surprising. The yeast *K. ohmeri* has now been isolated from the slime created by larvae as they develop on honeycomb and brood and from all stages of the SHB life cycle, including pupae and adults that developed from surface sterilised larvae (which were added to sterile soil). *K. ohmeri* has also been consistently isolated from adult SHB sampled from a number of apiaries in Queensland and New South Wales. Multi-locus DNA fingerprinting conducted on 71 yeast isolates revealed a large number of genotypes even within the life cycle isolates which were taken from

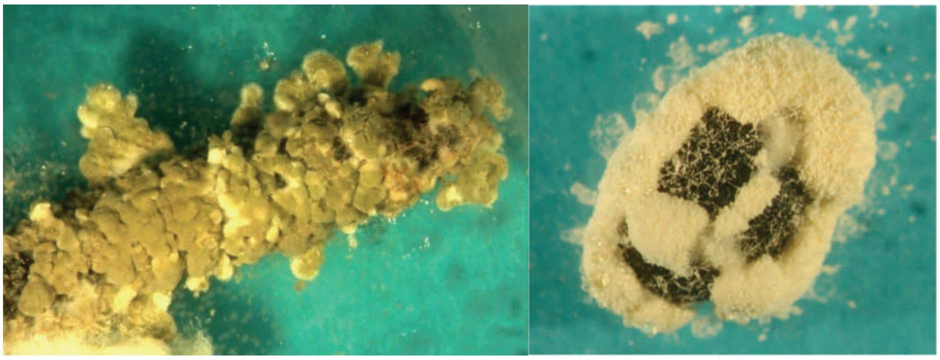

**Figure 3**: Larval SHB infected with *Metarhizium anisopliae* (left) and adult SHB infected with *Beauveria bassiana* (right).

various stages of the SHB in our laboratory colony. The identity of 12 yeast isolates from representative genotypes was confirmed as *K. ohmeri* through ITS sequencing. The molecular data gathered so far suggests that there may be a symbiotic relationship between *K. ohmeri* and *A. tumida.* One reason for the extensive investigations into this yeast is the concern that recent overseas reports have noted *K. ohmeri* to be an emerging pathogen of immunocompromised patients. The slime created by larvae when they destroy a hive is largely comprised of yeast cells and pollen, as well as honey and wax in the process of being broken down (Fig. 4). *K. ohmeri* is has been consistently isolated from slime sampled from hives as well as artificial slime created in the laboratory. The ITS sequences of the *K. ohmeri* isolated from SHB are identical to those isolated from overseas patients. Advice is now being given to beekeepers that when cleaning up a 'slime-out' they should first treat the slime with bleach to kill the yeast and, if hosing down affected hives, to wear disposable gloves and a protective mask.

Behavioural studies with the volatiles produced by hive and laboratory generated slime, and pure cultures of *K. ohmeri*, have confirmed the attractiveness of these volatiles to adult SHB. In parallel, preliminary GCMS studies have identified a range of chemical components common to the slime and yeast cultures but not related to honey or wax. It is hoped that these results will lead to funding for the development of an attractant volatile mix for use in an out of hive trap for SHB.

**Acknowledgements**

This research has been funded by the RIRDC honeybee program. A number of people need to be acknowledged for their valuable and varied contributions to this research: Kate McGlashan, Gary Everingham and Steve Rice (DEEDI) for technical support; Hamish Lamb, Peter Warhurst and the rest of the apiary section in Biosecurity Qld; Dr Bronwen Cribb and students (UQ) for help with insect behaviour studies; Dr Heather Smyth and Priduhvi Thavaraj (DEEDI/UQ-QAAFI) for GC-MS analyses; A/Prof Wieland Meyer and staff (Westmead hospital/ Sydney University) for molecular analyses; Dr Doug Sommerville and Nick Annand, apiary section NSW DPI; various beekeeping groups including Ipswich and West Moreton beekeepers and the Qld beekeepers Assoc.

For further information, or offers of large amounts of money for funding, e-mail: Diana.leemon@deedi.qld.gov.au

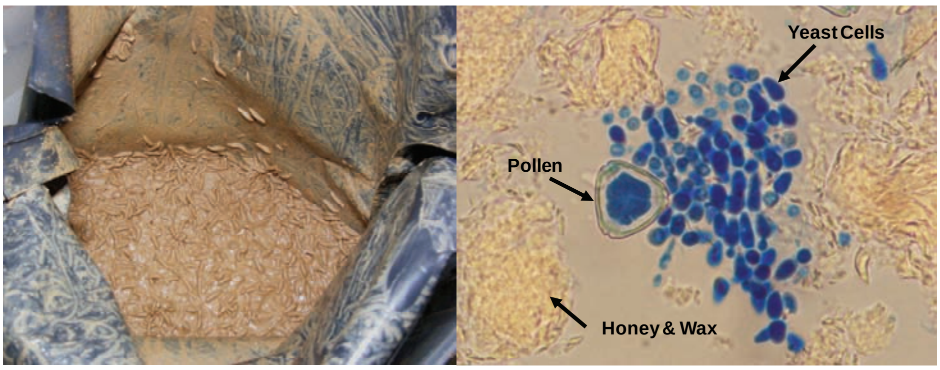


**Figure 4**: Slime created from SHB larvae feeding on brood and honeycomb (left) and micrograph of slime showing the yeast cells amongst the pollen, honey and wax (right).

# Notice of Next Meeting

## Tuesday 14th June 2011, 1pm

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# Notes and Exhibits
# &
# Student Award Presentation

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**Seminar Room 1**
**Ground Floor**
**Ecosciences Precinct**
**Boggo Road, Dutton Park**

**Maps and further venue information available at**
**http://www.esq.org.au/meetings.html**

**ALL WELCOME**


### News from USDA ARS Australian Biological Control Laboratory

**Raghu Sathyamurthy** recently travelled to the United States to meet with collaborating staff at the USDA ARS Invasive Plant Research laboratory in Fort Lauderdale, Florida. Raghu inspected field sites where the biological control agents of *Melaleuca quinquenervia* were having a major impact and discussed plans for demographic studies of downy rose myrtle, *Rhodomyrtus tomentosa*, with Dr. Paul Pratt. ABCL is conducting foreign exploration for biological control agents of this plant which is native to large parts of Asia but invasive in the US. In late May, Raghu, **Brad Brown**, **Jeff Makinson** and **Ryan Zonneveld** began surveys from Brisbane to the Iron Range surveying *Lygodium microphyllum*, *M. quinquenervia* and *Casuarina* spp.

## NEWS FROM OUR JOURNAL
## *The Australian Entomologist*

*The Australian Entomologist* is the Entomological Society of Queensland's scientific journal, published quarterly in March, June, September and December. Subscriptions are separate from ordinary membership of the Society and are currently $33 per year for Australian subscribers. A subscription form is on our website at http://www.esq.org.au/Aus%20Entomologist%20subs%20form.pdf

This year we welcome back as Editor, David Hancock, who was previously Editor for many years until 2009 when he took a year-long break for a long visit to the United Kingdom, the country of his birth. He is based back in Cairns. The rest of the Publication Committee (Assistant Editors Chris Burwell and Federica Turco, the latter also Manuscript Coordinator, and Business Manager Geoff Monteith) are at the Queensland Museum which has hosted much of the administrative operations of the journal for many years.

Last year we engaged a new printer who uses the Indigo digital printing system which produces all pages at high quality colour standard. This means that we no longer need to charge a premium page charge rate to authors for colour work and this enabled us to restructure our author page charges to a uniform $25 per page rate for unlimited colour.

We invite submission of manuscripts presenting new information on almost any topic of entomology from Australia and nearby countries from Wallace's Line to the Pacific, especially papers dealing with native insects, arachnids and myriapods. We have recently drafted new "Guide to Authors" guidelines and these are posted on the Society website at *http://www.esq.org.au/Authors%20guide%201.html* Intending authors are asked to check those guidelines and follow them closely in preparing their manuscript. Because our new printing system allows us to produce high quality colour reproduction it is especially important to have colour image files in the correct format and at the best possible resolution. Please pay special attention to the details about how to present image files and illustration layouts for publication. If you are in doubt about illustration matters for a manuscript you are preparing, it may be wise to seek advice from one of the Publication Committee before submitting. Final manuscripts should be emailed to the Manuscript Coordinator at federica.turco@qm.qld.gov.au or mailed on disk to Dr Federica Turco, Queensland Museum, Box 3300, South Brisbane.Q. 4101.

# NOTICES

## Australasian Invertebrates Conference

28 June—1 July 2011, Melbourne

A four day conference for breeders and enthusiasts of invertebrates. Days 1 & 2, at the Melbourne Zoo, covers butterflies, while days 3 & 4, covering other invertebrate groups, is to be held at the Melbourne Museum.

For more information, and to register your interest go to www.bugshop.com.au/aic/

## Membership Fee Reminder

Thank you to all the members who have kindly paid their membership fees so far this year. Membership renewals were sent out with the March News Bulletin (volume 39, issue 1). If you have misplaced your renewal form, or did not receive one, please email me (at the address below) and I will send you a replacement form.
Keep those renewals coming in!!

**Desley Tree, Honorary Treasurer**
desley.tree@deedi.qld.gov.au

# Entomological Society of Queensland
# Nomination for Membership Form

www.esq.org.au

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Surname _______________________________________________

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Seconded by ________________________________________________________

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Qld. 4068

**Please retain the receipt below for your records**

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**Entomological Society of Queensland—Receipt for payment of membership fees**

Name _____________________________________ Date ____________

Amount paid $_________________ for year/s ______________

## DIARY DATES 2011

*Meetings held 2nd Monday of the month (or Tuesday if Monday is a public holiday)*

| | | |
|---|---|---|
| MAR—Monday 14th | Matt Purcell | AGM and President's Address |
| APR—Monday 11th | Dr Diana Leeman | Small hive beetle, a recently established scourge of apiaries |
| MAY—Monday 9th | Dr Tim Heard (CSIRO) | Australian native stingless bees |
| JUN—Tuesday 14th | Notes and Exhibits & Student Award Presentation | |
| AUG—Monday 8th | | |
| SEP—Monday 12th | | |
| OCT—Monday 10th | | |
| NOV—Monday 14th | | |
| DEC—Monday 12th | | |

**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**: | Students and others at the discretion of the Society Council | **$18pa** |

Student membership conveys full membership privileges at a reduced rate.

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**THE *AUSTRALIAN ENTOMOLOGIST* SUBCRIPTION RATES**

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| | Institutions | **AU$37pa** |
| **ASIA/PACIFIC:** | Individuals | **AU$40pa** |
| | Institutions | **AU$45pa** |
| **ELSEWHERE:** | Individuals | **AU$45pa** |
| | Institutions | **AU$50pa** |

Subscriptions should be sent to the Business Manager,
*The Australian Entomologist* PO Box 537, Indooroopilly QLD 4068.

# THE ENTOMOLOGICAL SOCIETY OF QUEENSLAND


## NOTICE OF NEXT MEETING

Tuesday 14th June 2011, 1pm

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## Notes and Exhibits

*Several presentations including*: "A mermaid on the wind……
A short report on an amazing tiphiid wasp from South Australia"

**&**

## Student Award Presentation

"The effect of light on bioluminescence
in the glowworm *Arachnocampa flava*"

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Seminar Room 1
Ground Floor, Ecosciences Precinct
Boggo Road, DUTTON PARK

*More venue details available at*
http://www.esq.org.au/meetings.html

**ALL WELCOME**

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## NEXT NEWS BULLETIN

Volume 39, Issue 4 (June/July 2011)
due early August

**CONTRIBUTIONS WELCOME**

**DEADLINE - Thursday 21st July**
Send your news/stories/notices to the editor
( justin.bartlett@deedi.qld.gov.au )