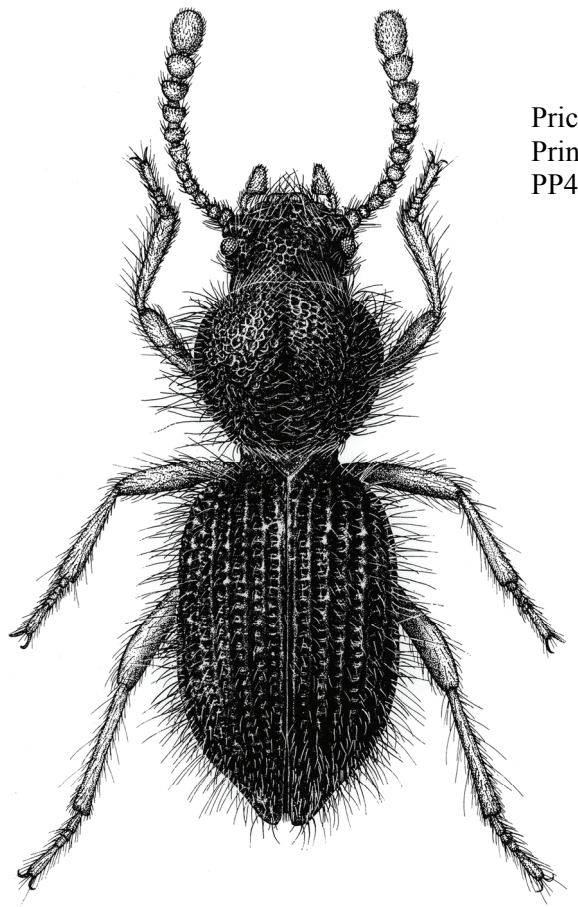
ENTOMOLOGICAL SOCIETY OF QUEENSLAND INC

NEWS BULLETIN



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THE ENTOMOLOGICAL SOCIETY OF QUEENSLAND

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Front Cover Illustration: *Apocryphodes thompsoni* Matthews, 1998 (Tenebrionidae; Adeliini). This specimen is a paratype illustrated by Geoff Thompson for the original description; collected from leaf litter in 1984 on one of Geoff Monteith's North Queensland field trips by Val Davies, Geoff Thompson and Julie Gallon, at Gayundah Creek on Hinchinbrook Island.

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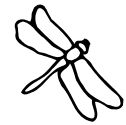


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The **ENTOMOLOGICAL SOCIETY OF QUEENSLAND INC.**, since its inception in 1923, has striven to promote the development of pure and applied entomological research in Australia, particularly in Queensland. The Society promotes liaison among entomologists 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 the Seminar Room, Ecosciences Precinct, Boggo Rd, Dutton Park, Tuesday October 9, at 1.00pm.

Chair: Geoff Thompson.

Attendance: Justin Bartlett, Sarah Corcoran, Kathy Ebert, Alexandra Glauerdt, Andrew Hayes, Tim Heard, David Holdom, Andrew Hulthen, Peter James, Cassie Jansen, Judy King, Chris Lambkin, Simon Lawson, Diana Leemon, Lance Maddock, Jaime Mayoral, Chris Moeseneder, David Merritt, Geoff Monteith, Mike Muller, Brenton Peters, Matt Purcell, John Purdie, Don Sands, Martin Shivas, Noel Starick, Geoff Thompson, Susan Wright.

Visitors: Pieter Arnold, Verna Hearne, Raethea Huggins, Heather Kelly, Brian Montgomery, Ian Myles, Kumara Nagalingam.

Apologies: Bradley Brown, Lyn Cook, Julianne Farrell, Ross Kendall, Doug McCarron, Morris McKee, Penny Mills, Federica Turco.

Minutes: The minutes of the last General Meeting were circulated in News Bulletin Vol. 40, Issue 6, September, 2012.
Moved that the minutes be accepted as a true record: Christine Lambkin.
Seconded: Don Sands.
Carried unanimously.

Nominations for Membership:
The following nomination for Membership was received and approved by Council, and is put forward for election: **General Membership**. Ms Nadine Baldwin, Capalaba, nominated by Judy King, seconded by Brenton Peters.

General Business:
1. The President informed members that the Society's website and the Bulletin are being revamped – more information in the near future.
2. Officers for 2013 – A reminder that nomination forms for the President and Council for 2013 will be in the Bulletin.
3. Entry forms for the Student Award are in the Bulletin, please encourage eligible students to enter.

Main Business

Biological Control of the Primary Dengue Vector *Aedes aegypti*: Three Tales

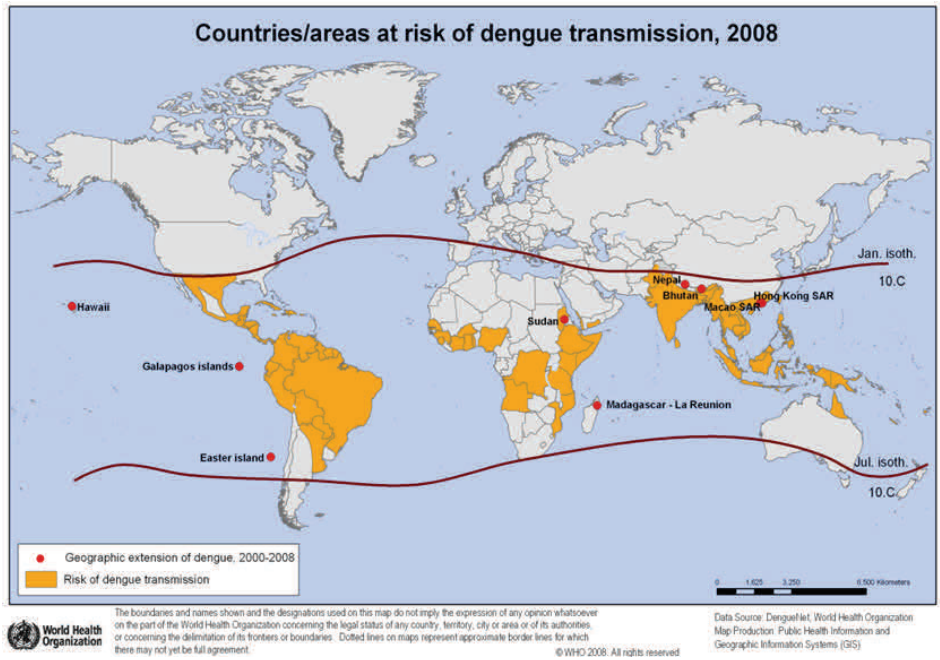
Dr. Jonathan Darbro, Queensland Institute of Medical Research

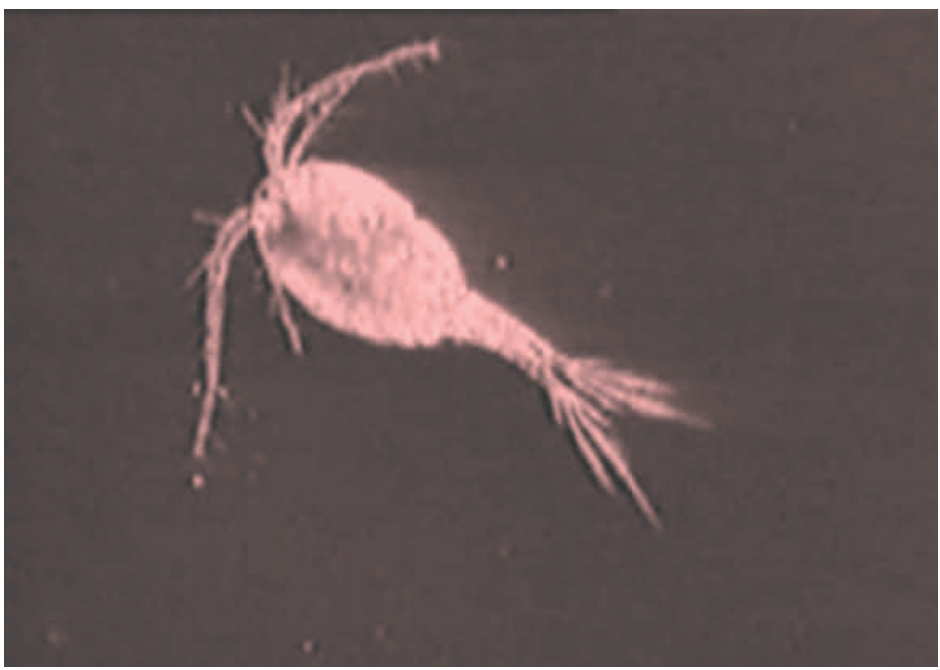
Dengue continues to be a major global public health concern (Figure 1). There are an estimated 50-100 million cases annually, including at least 2350 cases in Australia in the past 12 years. Dengue hemorrhagic fever, a more severe manifestation of the disease, kills about 50,000 people per year. Because there is no dengue vaccine, control of this disease is dependent upon control of its primary vector, the mosquito *Aedes aegypti*. Rising instances of insecticide-resistant *Ae. aegypti* may threaten the continued efficacy of chemical control, so alternative methods are needed.

Biological control may be one such alternative. There are a number of past and present research projects assessing the viability of biological control of *Ae. aegypti* using various agents. The Queensland Institute of Medical Research (QIMR) is involved in a number of these projects, three of which will be discussed here: predatory copepods (*Mesocyclops* spp.), entomopathogenic fungi (*Beauveria bassiana)* and endosymbiotic bacteria (*Wolbachia* spp.).

Mesocylops

Mesocyclops spp. (Figure 2) are freshwater copepods (Cyclopoida: Cyclopidae) and facultative predators: they normally eat detritus, microorganisms, etc., but will





Figures 1-2. 1). WHO map of global dengue distribution. 2). *Mesocyclops* sp.

readily consume first instar mosquito larvae if available. In communes in northern Vietnam, people store water in large jars because they don't have running water, and *Ae. aegypti* larvae readily grow and develop in these jars, contributing to dengue transmission. It was noted that jars that contained *Mesocyclops* tended not to contain mosquitoes. So the project was conceptually simple: put *Mesocyclops* in all of the water containers, and there will be no *Ae. aegypti* or dengue.

In practice, this required extensive top-down and bottom-up organization, community participation and education. Between 1998 and 2003, QIMR in collaboration with AusAID and with the support of the Vietnamese Ministry of Health, applied this practice in 6 provinces in northern and central Vietnam. Work included educating the communities on dengue, the transmission of dengue, the biology of the dengue vector and of *Mesocyclops*. Surveys were given before and after community engagement efforts to show that people were becoming more educated about dengue. Education extended to schools, where children would put on plays illustrating dengue control principles.

The trials were evaluated by measuring *Ae. aegypti* larval density before and after intervention, as well as the incidence of dengue cases. *Mesocyclops* resulted in considerable reduction in dengue cases in northern and central Vietnam (Kay and Vu 2005). Further effort also saw reduction of dengue cases and *Ae. aegypti* populations in southern Vietnam as well (Vu et al. 2012), where the more tropical climate contributes to even greater dengue prevalence. Not only was *Mesocyclops* shown to be an efficacious control method, but it can be applied by the community (the copepods live in local rivers) at an economical cost (estimated to be AU$0.28-$0.89 per person).

Beauveria bassiana

Entomopathogenic fungi such as *B. bassiana* and *Metarhizium anisopliae*—soil fungi whose spores are infective to arthropods—have a history of insect pest control surpassing 100 years. After an insect comes into contact with spores, they begin to grow within 24-48 hours from contact, usually by penetrating the cuticle. The insect dies in 3-21 days, depending on factors such as temperature and fungus strain, after which the fungus, if the conditions are conducive, produces the next generation of spores on the outside of the insect cadaver, ready to infect other insects (Figure 3).

Although attempts have been made to control mosquitoes with entomopathogenic fungi, they have not been very successful until relatively recently. Spores exposed to sunlight tend to die, and spores added to water were found to control larvae for a couple of days, but then became ineffective. In the early 1990s, people began to formulate spores in mineral oil to control terrestrial insects such as locusts, and this technology was soon adopted for adult mosquito control, beginning, in this case using *M. anisopliae*, with the primary African malaria vector *Anopheles gambiae* (Scholte et al. 2005).

My own research at CSIRO (Black Mountain, Canberra) and QIMR found that the FI-277 isolate of *B. bassiana*, originally collected by Richard Milner in Pemberton, WA, was virulent against *Ae. aegypti* in laboratory bioassays (medial lethal time = 7-8 days) and also was persistent in spore form at a range of temperatures (Darbro et al. 2011).

Many published studies take potential biocontrol candidates as far as the laboratory bioassay phase but don't go much further. We took the fungus to a pair of large (5 m x 7 m x 5 m), semi-field cages (Figure 4) at

Figure 3. *Aedes aegypti* mosquito cadaver killed by the fungus *Beauveria bassiana.*

James Cook University (Cairns, Queensland) to see how virulent it would be to mosquitoes in more realistic conditions. Insect pathogens can be sensitive not only to temperature but also to fluctuations in temperature, so laboratory bioassays in controlled environmental conditions may not be sufficient to assess a potential entomopathogen. The field cage walls were made of fine mesh, so the mosquitoes inside were subjected to similar fluctuations in temperature, light and humidity as outside the cage. Inside the cage was an aluminium garden shed as a facsimile of a human habitation (Figure 5). There were furniture, plants, water-filled containers, and even sweaty towels on loan from a local gym (to provide human scents for a highly anthropophilic mosquito species). Mosquitoes were able to fly freely within the cage, and were provided human blood daily from a volunteer.

Two experiments were run simultaneously in these cages, both experiments using one cage for controls and the other cage for *Beauveria*--infected mosquitoes. In one experiment, small cage bioassays were housed inside the large cages, identical to laboratory bioassays except being subject to environmental temperatures. In the second experiment, mosquitoes were able to fly freely about the large cages. Housing mosquitoes in large cages has two advantages over small cages. First, mosquitoes have to travel longer distances to find blood and oviposition sites, so any effects fungal infection may have on these behaviours would be detectable. Second, mosquitoes flying freely may be able to take advantage of warmer microclimates within the large cage. Some insects such as locusts have been observed to seek warmer temperatures than usual when infected with entomopathogenic fungi. Since fungal growth is

Figures 4-5. 4). Field cage for semi-field trials of *Beauveria bassiana* (James Cook University, Cairns, Queensland). 5). Interior of field cage for *Beauveria bassiana* trials. Garden shed and chairs simulate a human dwelling, the preferred habitat of *Aedes aegypti.*

inhibited at warmer (approximately >36C) temperatures, this behaviour was found to be associated with lower mortality.

The results in two trials (February and April, 2010) were that *B. bassiana* kills *Ae. aegypti* either at controlled or realistic environmental conditions (Darbro et al. 2012). Free-flight conditions in a large cage caused higher mortality to both control and fungus-treated groups, but *B. bassiana* still caused 59-95% mortality relative to controls. There was no evidence that mosquitoes sought warmer microclimates.

Finally, two sublethal effects of fungal infection were measured: blood-feeding success and fecundity. In the laboratory, 120 control and 120 *B. bassiana*-infected *Ae. aegypti* were held in individual cups. They were offered a blood meal on a human arm every two days, in such a way as that their behaviour could be observed (Figure 6). Eggs were also collected every 2 days. Behaviour was scored as a) whether mosquitoes displayed any sort of activity (flying, walking) in response to a host cue, b) whether mosquitoes successfully landed on human skin (through the fabric covering the

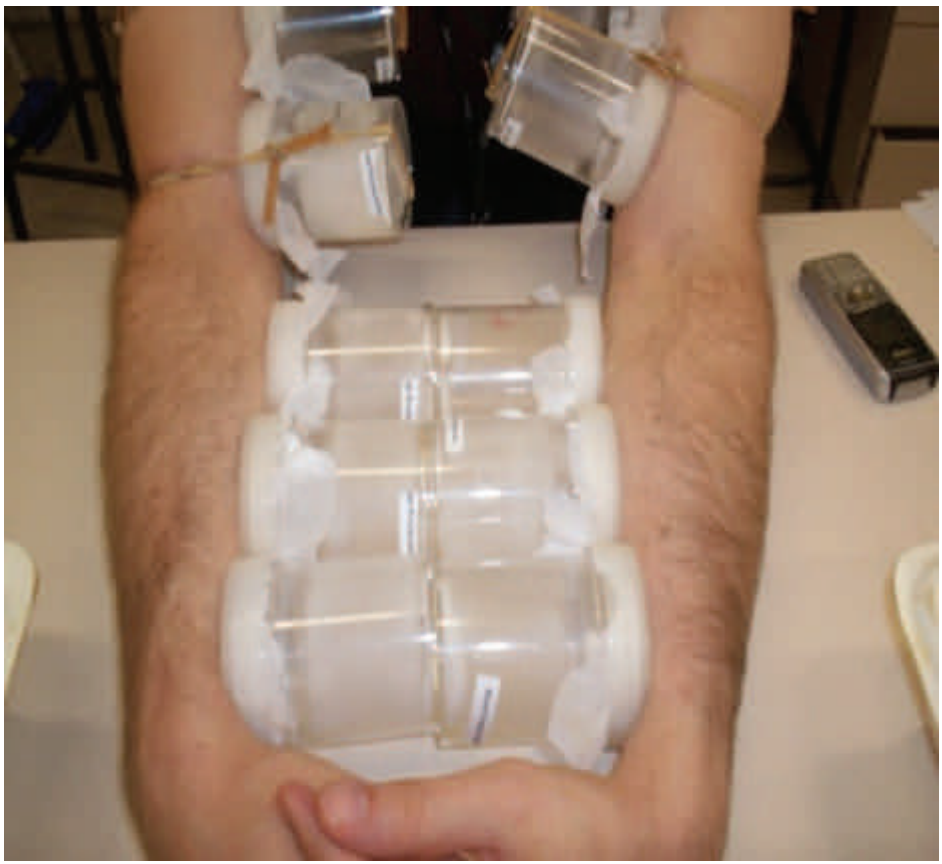


Figure 6. Observing blood-feeding behaviour of *Aedes aegypti.* Each cup held one female mosquito. Infection with *Beauveria bassiana* was found to reduce activity, host landing and blood-feeding success (see text).

cup), and c) whether the mosquito obtained a blood meal (whether it was engorged—in this experiment, very few mosquitoes were only partially engorged, it was usually either fully engorged or unfed).

We found that after 4 days of fungus infection, significantly fewer infected mosquitoes displayed activity compared to controls. After 6 days of infection, significantly fewer mosquitoes reached the human blood source. However, the number of blood-fed mosquitoes was similar between control and fungus-infected groups until 13 days post fungus exposure (Darbro et al. 2012). One way of interpreting this is that very hungry mosquitoes would manage to get a blood meal whether they were infected or not, whereas mosquitoes that would normally simply approach the host or maybe probe the skin when uninfected are the ones with reduced behavioural responses when infected with *Beauveria.*

In terms of fecundity, control mosquitoes laid more eggs per lifetime than did fungus-infected mosquitoes. When counting eggs per batch size, fungus-infected mosquitoes tended to lay more eggs per batch, although this was not statistically significant. When eggs were allowed to embryonate for 5 days then were placed in water, we found that egg survival was similar between control and fungus-infected mosquitoes (Darbro et al. 2012).

The next major challenge for the use of entomopathogenic fungi against *Ae. aegypti* will be getting the mosquitoes to come into contact with the spores. A paper was published in 2005 showing the efficacy of cotton sheets impregnated with *M. anisopliae* spores against *An. gambiae* (Sholte et al. 2005). This mosquito enters human residences at night under the eaves, and then feeds on the sleeping inhabitants. In other words, the mosquito has a predictable pattern with a point of interception. The researchers positioned the cloth underneath the eaves, and many mosquitoes were exposed to fungus this way. *Ae. aegypti*, by contrast, is a daytime biting mosquito that lives in and around human habitats. When the mosquito flies around during the day, chasing and biting people that are also moving around during the day, where do you put a fungus-treated surface to intercept them? One possible solution is to apply fungus spores to ovitraps to infect mosquitoes seeking oviposition sites.

Wolbachia

Wolbachia is a genus of bacteria that lives inside the cells of arthropods. One estimate is that 70% of insect species are known to harbor some species of *Wolbachia*. This bacterium infects the reproductive tissue in particular, and has been of interest to basic biology for decades because *Wolbachia* manipulates the reproduction of insects, sometimes in bizarre ways, to facilitate its own transmission. In some parasitic wasps, for instance, it can induce parthenogenesis. In some isopods it can cause feminisation in males. The reproductive effect of interest for mosquito control, however, is cytoplasmic incompatibility (CI).

CI is a poorly-understood phenomenon in which females that are not infected with a particular strain of *Wolbachia* produce no viable offspring after mating with males that are infected with *Wolbachia* (Figure 7). Infected females produce viable offspring whether they mate with infected or uninfected males, but all of their offspring will be infected with *Wolbachia* (i.e. it is maternally transmitted). Infected females, then, have a substantial reproductive advantage compared with uninfected females, even if *Wolbachia* induces a slight decrease in survival.

Cytoplasmic incompatibility can be thought of as a driving mechanism waiting to happen. If some effect to control mosquito populations or transmission of mosquito-borne disease were found, it could be

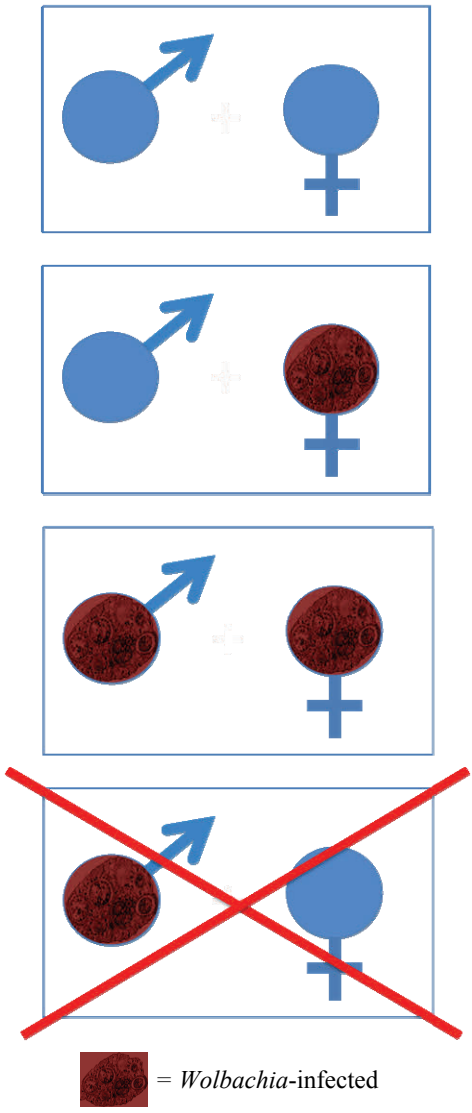


Figure 7. Cytoplasmic incompatibility. Females without a *Wolbachia* infection produce no viable eggs after mating with a *Wolbachia*-positive male. *Wolbachia*-positive females lay viable eggs, but all of the offspring are infected with *Wolbachia.*

coupled to *Wolbachia* with CI. A likely candidate is *Wolbachia* strain *w*MelPop, originally described from *Drosophila melanogaster*, which reduces the lifespan of the host insect by approximately 50%. By microinjecting approximately 10,000 *Ae. aegypti* eggs with *Wolbachia*, researchers in Scott O'Neill's lab at the University of Queensland (now Monash University), were able to transfect the dengue vector with this strain of bacteria, which has the same life-shortening effects as it did on the fruit fly (McMeniman et al. 2009).

Halving the lifespan of an insect doesn't seem too impressive, particularly in comparison to insecticides that kill almost instantaneously. It must be remembered, however, that the objective is to break the transmission cycle of dengue, not necessarily to exterminate mosquitoes. In order to transmit dengue virus, a mosquito must first bite a viremic human, then survive for the extrinsic incubation period of the virus, a time during which the virus escapes the midgut, spreads through the haemocoel, and finally infects and replicates within the salivary glands. This journey can take 8-14 days for dengue virus, depending on the temperature and virus strain. Most mosquitoes don't live that long, so it's only a slim minority of mosquitoes old enough to bite. By halving the lifespan, one removes almost all of these deadly geriatric mosquitoes from the population. Furthermore, because reproduction occurs earlier in life, there is very little selective pressure for mosquitoes to evolve any sort of resistance to such a life-shortening pathogenicity.

Before releasing a novel form of biological control such as endosymbiotic bacteria, a number of environmental risk assessments must be carried out to make sure it is safe. One such test was evaluating the ability of wMelPop-infected mosquitoes to transmit dengue virus, to make sure that some sort of super-vector would not be created. To everyone's surprise, it turned out that wMelPop

mosquitoes could not transmit dengue virus (Moreira et al. 2009). This was a very exciting discovery and made it seem even more likely that *Wolbachia* could help control dengue transmission.

Meanwhile, another strain of *Wolbachia* was found that could block viruses almost as well as wMelPop but did not shorten lifespan or have any other detectable effects on the mosquito. This strain, wMel, was shown in large cage experiments to be able to replace populations of uninfected *Ae. aegypti* (Walker et al. 2011), so it was decided that there would be a pilot release of wMel mosquitoes in northern Queensland. The release sites chosen were Gordonvale and Yorkey's Knob, chosen because it is unlikely that *Ae. aegypti*, a domestic mosquito, would fly from either of these communities into neighbouring communities (Figure 8).

Like in the *Mesocyclops* project, community support would be critical for any project proposing to release mosquitoes. The researchers engaged the communities for about two years before the release, to make

Figure 8. Sites of 2011 *Wolbachia* (wMel strain) release. wMel-infected mosquitoes were released from January through April. The suburbs of Yorkey's Knob and Gordonvale currently contain *Ae. aegypti* populations with virtually 100% wMel infections (see text).

sure that the residents understood the project and how it would impact on their community. The project, called Eliminate Dengue: Our Challenge, has a website (www.eliminatedengue.org), a hotline, and an office in downtown Cairns, with the name in front, where residents can walk in and ask questions. Due to these efforts, there was great support for the wMel release in 2011.

Mosquitoes were released between January and April. Thousands of larvae were reared every week, pupae were distributed into release containers until they emerged, the containers were driven out to the neighbourhood in a project van and released into the front yards of residents who had agreed to this beforehand. *Wolbachia* infection rate in each neighbourhood—the primary measure of success in this trial—was determined by collecting eggs in the neighbourhood, rearing larvae, and then testing the larvae for wMel via PCR. To include the community here as well, results were published in the local newspaper every two weeks, so the community would also know how the project was going. By April, the mosquitoes in Gordonvale and Yorkey's Knob and Gordonvale were 90-100% positive for wMel (Hoffmann et al. 2011). The team has continued monitoring since then, and those neighbourhoods are still virtually 100% *Wolbachia*-infected. This year, eggs were collected, reared into adults, tested for vector competence for dengue virus, and found to be incapable of transmitting dengue virus.

In 2012, emboldened by the success of wMel, the team decided to try releasing wMelPop, this time in Machans Beach and Babinda. Although wMelPop is even better at blocking virus transmission than wMel, wMelPop mosquitoes are considerably less fit. In particular, when *Ae. aegypti* eggs can normally remain viable when dry for a couple of months, wMelPop eggs begin to die not as positive in 2012. *Wolbachia* prevalence reached 80-90% prevalence by April again, but then fell to 40-50% in May. The team has responded by releasing wMelPop males during the winter (males do not bite, so the residents would get some respite!), but it is still not clear if wMelPop will be able to take hold in these neighbourhoods. Another release is planned for 2013 in the Cairns area, but the specific sites and *Wolbachia* strains to be used haven't yet been decided (there is a new third strain of *Wolbachia* under consideration).

QIMR's involvement in Eliminate Dengue is primarily through a proposed release of wMelPop in Tri Nguyen, Vietnam, planned for March 2013 (Figure 9). There are a number of important differences between Vietnam and northern Queensland as pertaining to *Wolbachia* release, many of which are cultural. Whereas *Ae. aegypti* larval development in Cairns takes place in a combination of water containers, garden accoutrements, discarded household items, rain gutters and cryptic breeding sites, most larvae in the release village of Tri Nguyen can be found in large water containers of the type residents use to store water for washing, cooking, etc. (Figure 10). Additionally, the team will have access to the vast majority of the properties on the island. These two facts mean that the team will be able to access most of the larvae on the island and therefore attempt pre-release suppression. Also, the houses are much closer together on the island, often less than 2 m apart. Perhaps most importantly, the Ministry of Health require as part of approval to do the project that mosquitoes be released in the pupal stage instead of the adult stage, and that the superior virus-blocker wMelPop be used instead of wMel. The Vietnam release then, in addition to being the first release of *Wolbachia* in a developing country, may also be the definitive test of the feasibility of wMelPop in the field.

Summary

Obviously every biological control trial is different, but there are a few common threads going beyond the science that can help determine success or failure. The biological control projects with which QIMR has been involved illustrate some of these threads. A central tenet of integrated pest management is to identify the target pest and manipulate its biology to customize control methods, and that is no different here. The container-dwelling nature of *Ae. aegypti* is a good example. *Mesocyclops* is perfectly suited to be placed into containers to consume mosquito larvae, and this has made possible the positive results seen in

Figure 9. Map of Vietnam, with approximate location of study village Tri Nguyen on Hon Mieu island (arrow).

Figure 10. Primary *Aedes aegypti* habitat in Vietnam is in large water jars used for water storage.

Mesocyclops trials. On the other hand, the most common application methods of entomopathogenic fungi are not as conducive to *Ae. aegypti* blood-feeding behaviour as they are to a nocturnal, endophagic mosquito such as *An. gambiae,* and this has proven to be an ongoing challenge.

Geographical and cultural factors also play a role. *Mesocyclops* would not be an acceptable method of control, for example, if Vietnam had the guinea worm *Dracunculensis medinensis*, or any other human parasite that used ingested copepods as intermediate hosts. Furthermore, the importance of community acceptance cannot be emphasized enough; without the support of the Vietnamese and Australian communities, projects like *Mesocyclops* and *Wolbachia* would have not made it far past the laboratory research phase.

Finally, there is luck. Science is at the mercy of luck, but sometimes it can be luck's beneficiary. Such is the case here. Sometimes you find out that bacteria that was intended to simply shorten a vector's lifespan actually renders your vector into a non-vector. When it comes to luck, you take the good with the bad and prepare to take advantage of opportunities that present themselves.

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Vote of Thanks: Mike Muller

Any other business:

The next meeting will be on Tuesday November 13, and the speaker will be Maria Fernanda Cardoso, an artist whose works include studies of copulatory organs of insects and other invertebrates.

The December meeting will be 'Notes and Exhibits'. Members are invited to give short informal presentations, and/or bring along exhibits. Please contact Judy King or Geoff Thompson if you would like to contribute. It is hoped that an evening meeting, followed by our traditional Christmas BBQ, will be arranged.

There will be a Biodiversity Conference in Nanjing, China, in 2013. Information will be provided in the Bulletin.

The meeting closed at 2.05pm.

NOTICE OF NEXT MEETING

Tuesday 13th November 2012, 1pm

~

Maria Fernanda Cardoso

A Marriage of Science and Art —The Museum of Copulatory Organs

Abstract: Maria Fernanda Cardoso was inspired by descriptions of the anatomy of the male flea and decided to investigate the anatomy of the genitalia of small creatures. The morphologies she found were so unusual and diverse that she thought they were worthy of becoming artworks and having their own museum. MoCO's first exhibition, at the recent 18th Biennale of Sydney, focused on invertebrate genitalia. Among the highlights of MoCo's collection are exquisitely made insect penis micro-sculptures made in bronze, glass and resin. Electron microscope micrographs depict one of the most extravagant and complex organs ever seen, the phallus of a local snail, a resident of the Sydney Harbour mangroves and salt marshes; earning the prize for the most convoluted reproductive female anatomy so far, is a female fruit fly, *Drosophila bifurca*. An insect sex video shows the transfer of a pink spermatophore between male and female stick insects, an event recorded for the first time ever.

Maria Fernanda is keen to collaborate further with scientists, institutions and sponsors to enable her to further add to and exhibit MoCO's growing collection of anatomical micro-sculptures, drawings and micrographs of all sorts of animal copulatory organs.

About the artist: Maria Fernanda Cardoso is an international artist of major standing, born in Columbia and currently living in Sydney. She holds a Masters in Sculpture and Installation from Yale University and has just submitted her PhD thesis at University of Sydney's Sydney College of the Arts, Rozelle.

Insects have been a recurring theme in much of her work. She is most famous for her Cardoso Flea Circus (1997-2000), a lost 19th Century tradition, which she revived and developed into a modern performance artwork. It has recently been acquired by the Tate Gallery London.

Maria Fernanda is represented in many of the great galleries of the world. She represented Columbia in the 52nd Venice Bienalle with "Woven Water", a starfish installation that now graces the foyer of Sydney's newly-remodelled Museum of Contemporary Art .

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

ALL WELCOME

News from Biosecurity Queensland (DAFF), Queensland Primary Industries Insect Collection

Justin Bartlett accompanied **Desley Tree**, **Kathy Thompson** and student **LiXin Eow** on two days of thrips-hunting in Lamington National Park in late September; with Justin foregoing thrips for beetles. Desley and **Laurence Mound** travelled north to Cape Tribulation for more thrips collecting as part of a three-year ABRS project. LiXin joined the party to collect fungal-spore-feeding thrips for her PhD thesis. Conditions were dry with thrips populations clustered and difficult to find and most success coming from bark spraying tree trunks and fallen logs - a technique passed on to Desley by Geoff Monteith. Two cassowaries were sighted crossing the road but unfortunately (or fortunately) no crocodiles were spotted. The team tackled many tracks in the remote pristine rainforest including the infamous Mt Sorrow track and returned safely with a good collection of thrips.

News from Biosecurity Queensland (DAFF), Invasive Plant Science group

Following the Queensland Government budget cuts, the weed biocontrol group at the Ecosciences Precinct has been considerably reduced. **Bill Palmer**, after over 30 years work in weed biocontrol will be retiring in November. Bill spent 12 years in the United States as entomologist-in-charge of Queensland's North American Field Station which was responsible for sourcing potential agents for American weeds. He then returned to the Tropical Weeds Research Station in Charters Towers before joining the team, which he presently leads, at the former Alan Fletcher Research Station. Also leaving the weed biocontrol group are **Cathy Lockett** and **Mariano Trevino** both of whom have also been with the group for very many years, as well as **Di Taylor** whose external funding is exhausted.

News from USDA ARS Australian Biological Control Laboratory

Jeff Makinson and **Ryan Zonneveld** are making progress with the stem-boring pyralid moth on the climbing fern, *Lygodium microphyllum*. This potential biological control agent was recently found at Bamaga on Cape York Peninsula. Similar moths have been found in SE Asia but have proved extremely difficult to rear under quarantine conditions. They are a high priority for research as they can kill *L. microphyllum* plants at the base which is significant given this climbing fern reaches above the canopy in Florida in the US where it is a very serious weed. **Bradley Brown** and **Kumaran Nagalingam** are evaluating a gall forming wasp, *Selitrichodes* sp. which attacks the swamp she oak, *Casuarina glauca*, another pest in Florida. The galls severely stunt the plants and appear to be highly specific. A similar species is attacking the coastal she oak, *Casuarina equisetifolia* in Guam. This insect could also be considered as a potential biological control agent.

Brisbane Koala Bushlands Bug-Catch Saturday 6th October, 2012

The 20th BugCatch was held at the **Alperton Rd Visitor Centre** in the Brisbane Koala Bushlands at Burbank, 15 to 17 km SE Brisbane, organised in conjunction with Mick Lawson, Natural Area Coordinator, East Local Asset Services, Brisbane City Council, and Kathy Ebert from the School of Biological Sciences, at the University of Queensland, as part of a field trip for the Insect Science and Terrestrial Invertebrate university courses.

Malaise traps and pitfall traps were set at two sites on the Thursday beforehand by Kathy, Chris Lambkin and Matthew Pohlmann, a Year 10 student completing work experience with Chris.

The Stockyard Creek circuit track at the Alperton Rd Visitor Centre gave some access to permanent freshwater, riparian habitat, spotted and scribbly gum, *Casuarina* stands, and some stringybark and ironbark.

Sweep netting, beating, yellow white and blue pans, dip netting, and hand searching were used from 10am with light sheets being set up at dusk. For the first time in many years, it did not rain, or threaten to rain. In fact, biodiversity was down due to the extended dry conditions, and the very hot day. The heat however, produced a good light sheet.

Over 50 participants had a great day collecting, with more than 40 UQ Entomology students (including 4 post-graduates) finding more than half their required 15 Orders of insects. Also in attendance were members Dave Merritt, Helen Schwencke, Geoff Thompson and his nephew, and Peter Hendry.

Highlights include the fly maggots: one found inside a termite nest and the other emerging from the abdomen of a stick insect placed into ethanol; the large number and variety of lacewings that were attracted to the light sheet especially Mantispidae; the Giant Wood Moth, *Endoxyla cinereus*; and the minute golden silverfish from the family Nicoletidae found in rotting logs.

Another BugCatch will be held in January 2013 in the Brisbane area, organised by Geoff Monteith and Lyn Cook. In October 2013 Chris and Kathy hope to hold a BugCatch in the Crows Nest area. Watch this space and the ESQ website for details for both events.

Chris Lambkin & Kathy Ebert
BugCatch Coordinators

Figures. 1). Chris Lambkin explains the Malaise trap to the students. 2). Dave Merritt delighted to catch Syrphidae near the water. 3). Chris takes specimens from the light sheet observed by students and Peter Hendry. (4-5). Mantispidae: 4). *Campion tenuistrigus* 5). *Ditaxis biseriata.* 6). Giant Wood Moth, *Endoxyla cinereus* Photos 1-3 Kathy Ebert, 4-6 Chris Lambkin.

NOTICES

Upcoming Conferences

1st International Symposium on Horticultural Insects Management (ISHIM 2012). 19-22 November 2012, Amman, Jordan. www.cardne.org/Pages/ishim.htm

XIII International Symposium of Scale Insect Studies (XIII ISSIS 2013). 2-5 September 2013, Sofia, Bulgaria. www.issis-bg.com

Death of Professor Douglas Stewart Kettle 28th Jan 1918-18th Oct 2012

Members will be saddened to hear of the death of Professor Emeritus Doug Kettle, who passed away, peacefully in his sleep, on 18th October. Prof. Kettle held the Chair of Entomology at University of Queensland from 1969 to 1977, retiring in 1983. He was 94 when he died. An obituary will appear in a future issue.

Nominations for 2013 Office Bearers of the Entomological Society of Queensland

Members are invited to use the following form to nominate office bearers for the Entomological Society of Queensland Inc. for 2013.

Nominations should be sent via email, fax or post and be referred to the:

Honorary Secretary, Entomological Society of Queensland

PO Box 537, Indooroopilly QLD 4068

Please return forms by end of January 2013.

A list of nominations received will be circulated in issue 10 of the News Bulletin, and an election held at the Annual General Meeting in March 2013. In the absence of a nomination for any particular office, the president may receive nominations at the Annual General Meeting.

Positions to be filled are as follows:

- Senior Vice President
- Honorary Secretary
- Honorary Treasurer
- News Bulletin Editor
- Councillors (3 positions)
- Business Manager (Australian Entomologist)

The Entomological Society of Queensland functions effectively because members play an active part in the Society. All members are encouraged to nominate for positions on the Council of the Society. If you want to know more about any of the Council positions, please contact one of the existing Council members listed on the front inside cover of the News Bulletin.

Office Bearer Nominations Form 2013

I nominate (name)

.....

For the position of

- Senior Vice President
- Honorary Secretary
- Honorary Treasurer
- News Bulletin Editor
- Councillor
- Business Manager (Australian Entomologist)

On the Council of the Entomological Society of Queensland

Nominated by

.....

Seconded by

.....

I accept the nomination

.....
(nominee signature)

Entomological Society of Queensland 2013
$500 Student Award

This is an award by the Society to encourage entomological research. Entries are judged by a panel of three entomologists appointed by the President of the Society. The winner will be announced at the May General Meeting and is then invited to present a summary of their research at the June Notes and Exhibits meeting of the Society.

Honours, Diploma and 4th year Degree students who received their qualification from any Queensland tertiary education institution in 2012 or 2013 may submit their entomology-based thesis or report for consideration.

Entrants need not be Society members.

These reports can be directed to the Society's Senior Vice President at the address listed on the entry form. However, please note that a hard copy of your thesis/report does not need to be submitted, and the submission of a PDF version is encouraged. This should be emailed together with a signed copy of the completed entry form to Simon Lawson at simon.lawson@daff.qld.gov.au

Closing date for submissions is Friday 12th April 2013

Entomological Society of Queensland
2013 Student Award Entry Form

Name

_____

Title of thesis or report

_____

_____

_____

Degree

_____

Supervisor

_____

Date of Examiners report or grading

_____

Return address for thesis/report (if applicable)

_____

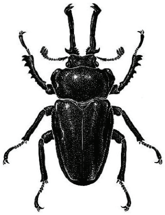
_____

Signature_____ Date_____

Send a copy of your thesis/report with a signed and completed entry form to:
Senior Vice President of the Entomological Society of Queensland
by email : simon.lawson@daff.qld.gov.au
or by mail: Simon Lawson
DAFF — Forestry
Level 3A West
Ecosciences Precinct
GPO Box 267
Brisbane Q 4001

Entomological Society of Queensland
Nomination for Membership Form

www.esq.org.au



Title________ First name________________________________

Surname ____

Email ____

Address____

___________________________postcode_____________Date______________

Nominated by ____

Seconded by ____

☐ General membership **$30 AUD**	I would like to receive my News Bulletin
☐ Joint membership **$36 AUD**	☐ electronically (PDF) by email
☐ Student membership **$18 AUD**	☐ in hard copy by mail

☐ Cheque/Money Order enclosed

or Please charge my : ☐ Bankcard ☐ Visa ☐ Mastercard

Name on Card ____

Expiry Date _______________ Signature ___________________________

Please return completed form to : Honorary Secretary
Entomological Society of Queensland
P.O. Box 537
Indooroopilly
Qld. 4068

Please retain the receipt below for your records

- -

Entomological Society of Queensland—Receipt for payment of membership fees

Name ______________________________________ Date ____________

Amount paid $_________________ for year/s ______________

DIARY DATES 2012

Nine general meetings held per year on the 2nd Tuesday of the respective month

MAR—Monday 12th	Lyn Cook	AGM and President's Address
APR—Tuesday 10th	Stephen Cameron	Insect Evolutionary Genomics
MAY—Monday 14th	Bill Palmer	Weed biocontrol. Where to now?
JUN—Tuesday 12th	Notes & Exhibits / Student Award Presentation	
AUG—Tuesday 14th	Ross Wylie	Qld's fire ant war—upping the ante
SEP—Tuesday 11th	Owen Seeman	Australian Herbivorous Mites
OCT—Tuesday 9th	Jonathan Darbro	QMIR — mosquito control
NOV—Tuesday 13th	Maria Fernanda Cardoso	Museum of Copulatory Organs
DEC—Tuesday 11th	Xmas BBQ	

SOCIETY SUBSCRIPTION RATES

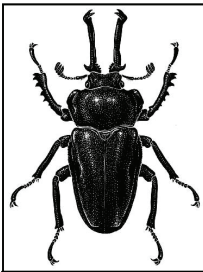
GENERAL:	Person who has full membership privileges	**$30pa**
JOINT:	Residents in the same household who share a copy of the *News Bulletin*, but each otherwise have full membership privileges.	**$36pa**
STUDENT:	Students and others at the discretion of the Society Council	**$18pa**

Student membership conveys full membership privileges at a reduced rate.

THE *AUSTRALIAN ENTOMOLOGIST* SUBCRIPTION RATES

AUSTRALIA:	Individuals	**AU$33pa**
	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 13th November 2012, 1pm

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A Marriage of Science and Art :
The Museum of Copulatory Organs

MARIA FERNANDA CARDOSO

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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

NEXT NEWS BULLETIN

Volume 40, Issue 8 (November 2012)
due early December

CONTRIBUTIONS WELCOME

DEADLINE - 4pm Friday November 23rd, 2012
Send your news/stories/notices to the editor
(justin.bartlett@daff.qld.gov.au)