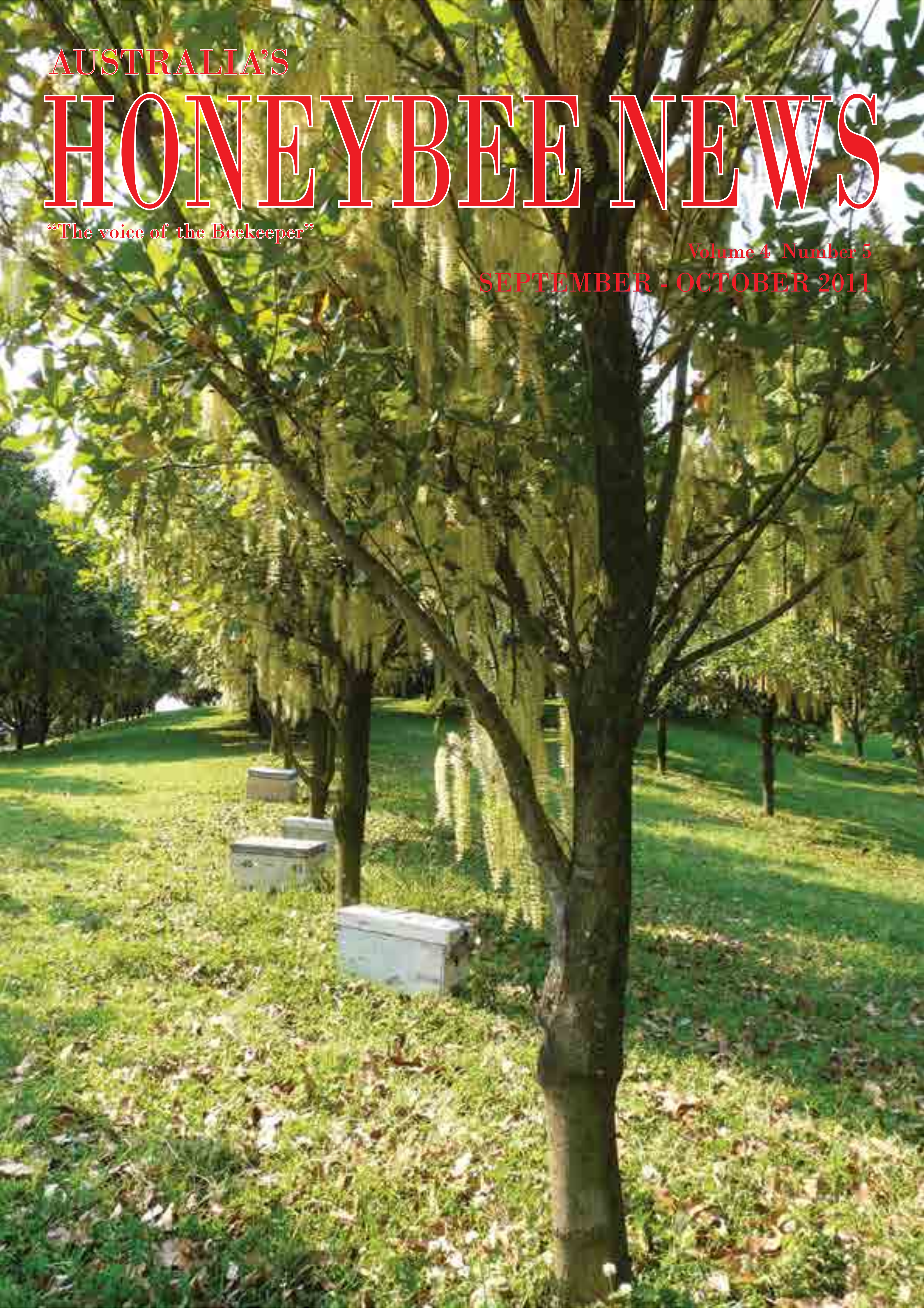
AUSTRALIA'S

HONEYBEE NEWS

"The voice of the Beekeeper"

Volume 4 Number 5

SEPTEMBER - OCTOBER 2011



AUSTRALIA'S HONEYBEE NEWS

The Journal of the NSW Apiarists' Association Inc. (NSWAA)

Published Bi-Monthly ISSN 1835 6621

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COVER: A bumber crop of Macadamias this year in Northern New South Wales Photo: Geoff Manning

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The opinions expressed in articles published in *Australia's Honeybee News* are those of the authors and do not imply the endorsement of the NSWAA for the promotion of any product, goods or services mentioned unless specifically stated.

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PRESIDENT'S REPORT

Season
The season has improved slightly over the past few weeks with some handy falls of rain over most of the State. The cool to cold weather which followed the rain has held back production. Honey flows are few and far between. Some of the winter – spring Iron barks have produced a reasonable crop in the North of the State, with some production from Mugga Iron bark in the Central west and Southern regions.

Overall production to date is limited and future prospects for New South Wales in general are quite limited. Bees in most regions have built well and are in good order.

Supply
Honey is getting quite short for some packers with beekeepers' supplies going straight to packers as it is extracted.

Unless the other States have a good producing flow during the next few months, overall production for the year may just be enough to supply domestic needs.

Website
Kieren Sunderland has been commissioned to construct our website, and his latest update is that he has registered the domain name and hopes to begin construction over the next few weeks.

Cairns Volunteers
To date 50 volunteers have travelled to Cairns to assist with the Asian Honey Bee Program. Of these 32 have been from New South Wales. Many thanks to all for this tremendous effort.

2012 State Conference
It has been decided to hold the 2012 Annual State Conference on 24 & 25 May at the Coffs Harbour RSL Club. Our hosts will be the North Coast and Mid North Coast Branches who will hold a field day on Saturday 26 May. The Trade Show will run again throughout the two days of Conference

State Secretary
As mentioned in the last report, the NSWAA has an interim secretary, Mrs Marlene Weiss.

As mentioned in the last edition our Secretary Julie Lockhart indicated she wished to leave, so arrangements were made for Marlene to be interim secretary until a permanent one is appointed. Contact details are on Page 4 and please note new email address: **nswapiaristsassociation@gmail.com**

Thank You Julie
I would like to take this opportunity to thank Julie for the work she did for the Association over the past eight years. Julie worked in a very professional manner to ensure that the Conference ran smoothly each year. She worked extremely hard each Easter coordinating the Honeyland Stand at the Sydney Show as well as looking after the many other Association duties throughout the year.

Hopefully some members will be able to catch up with Julie at the 2012 Sydney Show as I'm sure we can get her to volunteer for a day!

On behalf of the Executive and Members, thank you Julie, keep well and our best wishes for the future.

Bill Weiss
State President

Julie managed to avoid the camera on most occasions but not this time - we captured that big smile while she was working at the Show

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The Secretary is responsible for the routine maintenance of the Association

- Experience in Word, Excel and MYOB along with proven organisational skills are required.
- Knowledge of the industry and its structure is desirable.
- The premises of the job will be from your home location. A laptop and printer are provided for the position.

Duties include:

- Organise annual conference in regional NSW (including liaising with conference venue, organising accommodation & travel for speakers, preparing agendas, coordinating the conference papers, taking minutes & organising sponsors.
- Preparing the Quarterly BAS, payment of bills and banking.
- Membership database, website maintenance, mail-outs, phone calls from members and general public and liaising with *Honeybee News* Editor.
- Travel approximately once every three months for 3-4 days to attend and take minutes at Executive meetings held in regional NSW.
- Organise the honey stand at the Sydney Royal Show - includes ordering stock, liaising with RAS Staff, availability before, during and after show to manage stock and staff. Arrange volunteer staff roster as well as accommodation for country volunteers. *(The Secretary is paid an additional fee of $2,500 as Show Coordinator).*

Apply in writing by 31 October 2011 to:

The Secretary
PO Box 649 Glen Innes NSW 2370
Email: nswapiarisistsassociation@gmail.com

NEW MEMBERS

A warm welcome to the following new members:

Colin Broos	Possum Brush
Bill Casey	Hamilton
Roberto Cifuentes	Maroubra
Andrew Davis	Coffs Harbour
Andrew Izard	Woolgoolga
Peter Matthison & Aspen Charlesworth	Elands
Nathan McGuire	Cundletown
Barry McLean	Murwillumbah
Robert Toet & Ellen McIntyre	Lake Albert
Debbie Porter	Yetholme
FC & AM Taylor	Wallabadah

LETTER TO THE EDITOR

AHBIC Performing For Beekeepers

With reference to the recent article in the NSWAA Honeybee News by Bill Weiss, the statement that "AHBIC is being run by some of the packers", is nonsense if he refers to Capilano's position.

A democratic process exists whereby many other votes outnumber Capilano's in any vote at AHBIC. Beekeeper organisations have the majority of votes.

Bill Weiss's response to the vote by his peers is to blame some sort of seismic shift in culture as the reason for the vote. Perhaps the result reflects what the majority wanted.

Unsupported allegations of the type in Bill's letter lack credibility.

It is evident Bill didn't like the result and proposes a new body to skirt around the debate and outcome of a vote that happens in a democratic process.

Roger Masters
Capilano Honey Limited

UNFINANCIALMEMBERS

Ensure that your membership is up to date renew today. If you are unfinancial this will be your last copy of *Australia's Honeybee News*.

EXOTIC PEST WIPING OUT POLLINATION

After a couple of years of noticing the demise of the healthy clouds of bees in his orchard, commercial passionfruit grower Keith Paxton discovered the problem – an exotic pest that had all but wiped out wild European honey bees in his area, taking away the essential free pollination services they had been providing for his crop.

The invader in question is the small hive beetle, which has spread into Queensland from northern New South Wales, where it's believed to have first landed from its native Africa.

Mr Paxton, current president of industry body Passionfruit Australia, and his wife Judith farm near Woombye on the Sunshine Coast, producing 130 tonnes of passionfruit and 20-30 tonnes of lychees each year for the domestic market.

Their remedy was to bring in their own hives to place permanently in the orchard and surrounding bush, and Mr Paxton says the difference they have made to fruit quality is tremendous.

"A major source of pollination for the fruit used to be some enormous natural hives in hollow trees around the orchard - some hives were nine metres long and half a metre wide. They had been there for 30 years, but it only took two years for the small hive beetle to kill them off," Mr Paxton said.

"As a direct result of the loss of bees we ended up with passionfruit that had a reduced amount of pulp and juice, simply because the flowers had not received adequate pollination.

"We have eight hives now and we're seeing great fruit again. I hope to increase that to 20 hives this year, which we manage diligently through a program of baiting to keep small hive beetle at bay," he said.

A research effort on behalf of the horticultural, agricultural and pollination industries, the Pollination Program is highlighting the importance of wild bees in providing incidental pollination to a range of crops.

Australia has a large population of unmanaged wild European honey bees and agriculture relies heavily on the free pollination services they provide. However, many horticultural crops may not reach their full potential in terms of quality and yield without paid pollination.

The Program last year released the report Pollination Aware, with case studies of 35 pollination-responsive crops, including passionfruit and lychees. Each one outlines how best to manage pollination for that crop and the number of managed hives required for optimal pollination.

The Pollination Program is managed by the Rural Industries Research and Development Corporation (RIRDC) and Horticulture Australia (HAL). More details about the research, including the report Pollination Aware, are available on the website at www.rirdc.gov.au/pollination.


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HONEY CONTAINING GM POLLEN MUST GET EU APPROVAL

Brussels, 6 September 2011 (Reuters)

Honey containing even small traces of pollen from genetically modified (GM) plants must receive prior EU authorisation before it can be sold as food, Europe's highest court said today.

The ruling could open the way for compensation claims by beekeepers against biotech companies such as Monsanto, and EU authorities said it could hit European imports of honey from countries where GM crops are widely grown.

The case was brought by German beekeepers from Bavaria, who in 2005 found their honey contained traces of pollen from insect-resistant GM maize (corn) plants developed by Monsanto, which were being grown for research purposes near their hives.

The beekeepers said the presence of pollen from GM plants in their honey made the product unsuitable for sale and consumption, and brought legal action against the Bavarian authorities which authorised the field trials of GM maize.

"Products such as honey containing such pollen constitute foodstuffs which contain ingredients produced from GMOs," the European Court of Justice said in a statement.

"The pollen in question consequently comes within the scope of the (EU) regulation and must be subject to the authorisation scheme provided for there under before being placed on the market," the statement said.

Environmental campaigners said the ruling proved that GM and non-GM agriculture could not coexist in Europe, and that the European Commission should reverse its recent decision to allow traces of unapproved GM material in feed imports to the bloc.

"Monsanto and the Bavarian state that grew the crop should be held fully liable for this genetic pollution and compensate any beekeeper affected," Greenpeace EU agriculture policy adviser Stefanie Hundsdorfer said in a statement.

A spokesman for Monsanto refused to comment on the specifics of the case, but said there were no safety concerns with its MON810 maize.

"This case is about the legal technicalities of the EU approvals of MON810. The safety of MON810 is confirmed by multiple regulatory approvals, including those in the EU, and by up to 15 years of successful commercial use and consumption," the spokesman said.

A spokesman for the Commission said the EU executive was still studying the ruling, but that it could have an impact on imports of honey from countries such as Argentina, where GM crops are widely grown.

Imports accounted for 40 percent of EU honey consumption in 2007, and were worth a total of 375 million Euros ($528.4 million), the Confederation of British Industry said in a 2009 report.

DO YOU CARE ABOUT YOUR INDUSTRY

I have been involved with the beekeeping industry now for 34 years and am a 3rd generation beekeeper. I stand on the State Executive and am President of our local Branch.

After being elected onto the State Executive in May 2010 I have now seen how the NSWAA works on the inside and how much work is done.

One of the first things I was involved in was the Asian Bee Rally in Canberra in March 2011. For an industry to go to meet politicians at very short notice I thought was a very good start, as well as a lot of work in a very short time by a few industry people. When the day came to hold the rally I was disappointed with the number of beekeepers who didn't attend.

One thing the politicians have asked for is more industry involvement, and when you have 200 beekeepers turn out for something that will affect YOUR INDUSTRY as a whole I think all who didn't attend should have a hard look at how you think this industry can get support for industry affairs if industry doesn't have your support.

After saying that I now would like to say, that since our last branch meeting in July we were asked if our past secretary and myself could organise a fumigation course for our members. This is just another reason that has encouraged me to write this article in your *Honeybee News*. The most annoying thing was when making the effort to ring the beekeepers to see if they wanted to attend the course the question asked was 'how much would it cost'. With saying that, it is up to the individual to make their own mind up but it shouldn't be made because of the cost of the course, as when asked how to use Phostoxin correctly most had no idea. Phostoxin is the most used chemical for wax moth control and it would be a sad thing to see a beekeeper's health affected to the extent that WorkCover has to be called in, and the industry loses another good chemical.

The only way this Industry can survive is for all beekeepers to unite – don't wait until Varroa arrives it might be too late!

I would like to see more beekeepers support their local branches and it would be nice to see more attend State Conference as this is where ideas and concerns can be addressed.

Mal Porter, President Central Tablelands Branch
Ph: 02 6337 5383, Mobile: 0428 375 383

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WHAT IF VARROA WAS FOUND?

My previous article in the Honey Bee News finished with *What happens when/if varroa mites or any other exotic pest or disease of honey bees is found in NSW*?

If you believe you have an exotic pest/disease in your hives, you should ring the emergency animal disease hot line 1800 675 888. The personnel who manage calls on this number are highly trained to quickly assess the situation and seek further advice from staff within NSW Department of Primary Industries (DPI), including myself.

For the purposes of this article we will suppose that we are dealing with a case of varroa mites in a hive in inner Sydney. In fact, this could have been the situation in mid June. I was in the shed designing and building a new bottom board for a research project when Rob Bowman (Senior Inspector based in Sydney) rang and said that he was in an inner Sydney suburb visiting a beekeeper due to a nuisance bee complaint. On inspection of the bee hives, one hive was exhibiting classic symptoms associated with Parasitic Mite Syndrome and he wanted to know what was my call of the situation. Words not repeatable were followed by instructions to Rob to collect two or three frames of brood and a few hundred adult bees in a secure container and head to our Veterinary Laboratory at Camden as soon as possible.

Ninety minutes later Rob was met by Garry Levot, one of the entomologists on staff. I had already spoken to Garry and instructed him what to do. The adult bees were washed in alcohol to separate any mites. The procedure was followed, but no mites were found. The brood combs were examined and the cappings removed. The developing pupae were removed with forceps and examined for mites, again no mites.

The above scenario was real – it happened Friday afternoon before the June long weekend.

By the time it was established that the samples were negative the Chief Veterinary Officer and Principal Director BioSecurity, and a number of other key staff in the Department, had been notified earlier of a possible varroa incursion in Sydney. They all had to be informed it was a false alarm for varroa – thank goodness.

The remaining samples were sent to Orange to the DPI entomologists to inspect for internal mites. The samples were later reported to be negative.

In this case a sugar shake test may have been sufficient to test for varroa on site. Beekeepers can easily carry out this test.

So what would have happened if the sample was confirmed positive for varroa mites?

The DPI is constantly receiving information that might indicate an exotic incursion of a pest or disease of some description. This information is carefully considered. Depending on the situation an inspector may be asked to investigate, the person making the report may be asked to collect samples or take pictures and email them to the investigating officer.

It is not likely that an incursion of varroa mites will be found immediately they arrive in Australia, as the population of mites may take considerable time to build up in numbers before the hive demonstrates visual symptoms of the infestation. There is no strategy available that can guarantee finding the first mite to arrive in Australia.

Back to our hypothetical scenario – and the sample submitted was positive for varroa. What happens next?

First step is to ensure that this is a positive case of varroa mites in a bee hive in Australia. This may require samples to be sent to a DPI entomologist and/or CSIRO in Canberra. Once you have seen a varroa mite you are unlikely to mistake it for something else, although occasionally native flower mites hitchhike on bees.

Once all doubt is removed and varroa mites are confirmed, the Chief Plant Protection Officer (CPPO) notifies the other States and the Federal Government via the Consultative Committee on Emergency Plant Pests (CCEPP). He also notifies the NSW Beekeeping Industry via the NSW Apiarists Association and AHBIC. Key DPI staff are also notified of the situation. The next phase swings into action – the operational phase.

This is when a number of staff within the DPI, who are experienced and trained for such events, take charge. The aim for this group is to determine how widespread the varroa incursion is and provide information to the CPPO on a regular basis (daily if needed) on the progress of the investigation.

Three positions need to be filled very quickly – Planning Manager, Operations Manager and Logistics Manager. The Planning Manager is responsible for sample identification, media and public relations, assessing risks, keeping interstate authorities and the beekeeping industry informed, and legal issues, plus more. This position is likely to be filled by several people.

The Operations Manager will cover the surveillance and tracing of the known bee hives, coordinate field teams, provide mapping, and coordinate destruction of infected colonies. The staff under the planning manager will most probably be working full time on the incursion, whereas staff working in the other areas may only be required periodically, as and when required.

The Logistics Manager takes care of inducting staff into the operation, this may also include beekeepers at some stage during the response. They need to be conscious of OH&S issues, particularly where bees are concerned as there are only a limited number of staff within the DPI who are proficient at handling bees. They will also need to manage administration, stores, transport, personnel, finance, accommodation, meals, laundry etc. There may be several staff under the logistics manager taking care of these issues.

During the initial set-up phase, which may take several days, there will be immediate action to contain the known contaminated site. Hives on sites known to have varroa mites are referred to as Infected Premises, or IPs.

The initial site becomes IP1. The beekeeper will be given a notice of quarantine for all bee hives and materials (supers with combs) that could cause the spread of the mites.

The beekeeper will be interviewed (asked many questions is probably a better set of words) to ascertain how the mites may have found their way into their hives. It is extremely important to find out how the mites got into the bee hives. If the location of the hives was close (within 1.5kms) of a known high risk site such as a shipping container terminal, then this would become the number one suspect point of entry. Investigations will also occur to determine if any bees were brought into Australia illegally.

A Restricted Area (RA) will be declared, encompassing the IP1 area, which would prohibit the moment of any bee hives or equipment out of or into this area. If IP1 was in a sentinel hive near Port Botany, then the RA would encompass this region, surrounded by a larger area called a Control Area (CA). This initially may include a significant area of the Sydney Basin.

As teams are formed, they will be instructed to visit all registered beekeepers within the RA and test all hives for varroa mites. As more teams form, testing of hives would extend into the CA. During this process, interviews with beekeepers will identify any hive movements in the past 12 to 24 months. The information gathered from these beekeepers during the inspections may be followed up by the operations manager in the future if the apiary is found to have varroa mites. The speed at which apiaries are inspected and tested within the RA and CA is dependent on the number of field teams. Initially this will be DPI staff, most likely regulatory officers who are also involved in bee work. The operations manager may decide that beekeepers need to be employed to expedite this initial investigation period.

The field investigations and inspections are likely to be coordinated from a local control centre somewhere in the Sydney Basin. A review of each day's activities will be conducted and decisions on where teams will go to the next day will be made based on the results of the previous day's activities. The operations manager is likely to initiate a report of the findings and investigations as and when requested by the CPPO.

At some stage, teams will be assigned to seek out and test feral or wild colonies within the RA for varroa. As the results unfold, a clearer picture will form on how extensive the incursion is. This information will be relayed back to the CCEPP and the beekeeping industry. The bulk of the beekeeping industry will be informed of the progress of the response by press releases (mass media) from the DPI or from the beekeeping industry organisations.

At some stage a decision must be made whether this varroa mite incursion is eradicable. An extensive report with analysis of its predicted spread will be circulated to all parties and a decision made at a national level by the National Management Group (NMG). This group includes the heads of all the states and commonwealth departments of agriculture/primary industries and representatives of the beekeeping industry. Up to this point, the full cost of the surveillance program to determine how far the mite has spread is covered by NSW DPI. Once a decision is made that it is eradicable, then all interested parties (Government and Industry) are bound to an agreement whereby they pay for a percentage of the eradication program.

In the case of varroa mites, the cost sharing agreement previously negotiated was 80% government and 20% industry. The industry primarily in this case is the beekeeping industry. The beekeeping industry has been for some time attempting to include several plant industries in their 20% commitment to reduce the liability to the beekeeping industry.

If an eradication program is attempted, then decisions will be made to destroy all known colonies of bees within the RA, which will also include all feral hives. This is expected to take a considerable amount of resources.

Continued testing will occur in the CA and the rest of the state to ensure the mite has not breached the containment lines. Continued surveillance and testing may occur for two years before the program is declared successful. If further cases of varroa are identified, then the decision to eradicate is reviewed by the national committee. Any significant developments during this whole process will probably trigger a meeting of the CCEPP.

At any stage the National Management Group may decide that sufficient evidence has been gathered to clearly indicate the possibility that eradication is no longer feasible. Further discussion may decide that varroa is now endemic and stand down the whole process, or a containment strategy may be warranted.

If either decision is made, the education of beekeepers on identification and control options would become a major role in the program, probably conducted by DPI staff.

A major component of a successful eradication attempt is finding varroa early. Another factor is the sensitivity of the tests for varroa. New Zealand found varroa mites in Auckland in 2000 and went through a similar process as described in this article. The decision was made that the mites where not eradicable. Serious planning was put in place to detect mites early if they entered the South Island. Mites were found using this surveillance in 2006. Extensive surveys were again conducted and a recommendation was made that there was a good chance (95%) of successfully eradicating varroa around Nelson in the South Island. But the cost was estimated to be $10 million for the first year, plus there was a high probability of reinvasion of varroa mites from the North Island. The government of the day made the decision not to eradicate and instead to adopt a containment strategy. Decision making at this level is complex, with a lot at stake.

Hopefully we don't have to play that game!

(Acknowledgements in preparing this article: Annette Somerville - editing, Bronwyn Hendry - Policy Officer, Biosecurity DPI, Michelle Taylor - NZ Scientist)

BEES & HONEY in the news..............

Let them bee

Given that the beauty industry regularly promotes the injecting of a potent neurotoxin into anyone who wants a wrinkle-free face (that would be Botox) this is not even close to one of the strangest things people will do in the name of fashion. But the latest craze, smearing on bee venom, is not winning too many fans on the animal welfare front. The Bee Venom Mask, a recent arrival in Australia, boasts its mixture of bee venom and honey "fools the skin into thinking it has been lightly stung", which supposedly causes a smoothing effect.

All good so far, but the venom is apparently collected by zapping bees with electricity and they do not mind a jot, the company spokesperson said. "New Zealand bees lead a charmed existence in the stress-free natural environment they inhabit. No bees are killed and we don't believe they are harmed with the collection of the bee venom." Still, it is enough to raise the eyebrows of PETA. "Why can't people just leave the bees alone?" Des Bellamy of PETA Australia said. "Bees may not be cute and cuddly, but they have a complex form of communication based on sight, motion and scent that scientists still don't fully understand. This would definitely not get our cruelty-free seal of approval."

Funny Jelly nets fine

A New Zealand company that imported Chinese powdered royal jelly and sold it in capsules claiming it was 'Made in New Zealand' has been fined NZ$11,400.

Honey New Zealand (International) Ltd admitted two charges of breaching the Fair Trading Act in relation to the marketing and distribution of the royal jelly capsules through stores in Auckland and Christchurch. The Commerce Commission withdrew a third charge that the royal jelly was not of the potency claimed.

The Commission says Honey New Zealand arranged for Chinese powdered royal jelly to be mixed with white beeswax and inserted it into capsules. The product was labelled as Made in New Zealand, carried an image of the New Zealand fern and a statement, "Honey NZ has over a 90 year history working with premium honey bee products gathered from the heart of untouched native forest and wild field areas of New Zealand."

A commission statement says in fact the only part of the product that was genuinely from New Zealand was the white beeswax the royal jelly was mixed with and the water in the capsule shell. Honey New Zealand admitted that six out of eight of the raw materials in its royal jelly were sourced from overseas.

In the judgement, Judge Allison Sinclair said "in my view the statements made on the label departed significantly from the truth." She commented further, "the label led consumers to believe they were buying a superior New Zealand made product when in fact they were not."

Once caught, Honey New Zealand stopped distributing the royal jelly product and relabelled its products.

Healthy Honey

Honey from the Australian native myrtle tree has been found to have the most powerful antibacterial properties of any honey in the world.

Queensland health experts are now considering using it to treat bacterial infections, such as Methicillin-resistant Staphylococcus aureaus (MRSA), that often occur in hospitals and nursing homes. MRSA can be difficult to treat because new strains keep emerging that are resistant to existing antibiotics.

In tests, researchers at the University of Queensland and the Department of Economic Development & Innovation discovered the native myrtle tree honey has high levels of a key bacteria-fighting compound.

"The sheer strength, due to high levels of active compounds, in these honeys, has meant we have been able to completely inhibit MRSA with a relatively small quantity of honey," says Chief Researcher, Dr Yasmina Sultanbawa. "This could provide enormous benefits to MRSA patients."

No need for plan bee

Stevedores at the Port of Brisbane felt a buzz in the air while unloading vehicles from Thailand.

The stevedores discovered a nest of over 2000 exotic red dwarf honey bees in the wheel arch of a Toyota Hilux.

Australia quarantine officers arrived on the scene to supervise the treatment of the area with insecticide.

The bees, native to south eastern Asia, were not carrying any harmful parasitic mites that could damage Australia's honey bee industry.

No other life insects were found.

Following inspection, the remaining 990 cars were released from quarantine. Operation Science Program officers are confident no bees escaped the enclosed area.

International Bee Health Symposium 2012

The Symposium will be held on Saturday, 24 March 2012 at the Citywest Hotel, Dublin, Ireland.

A special discounted registration of €50 is available until Friday 16 December 2011.

As the decline in the world bee population reaches critical levels, a conference between the beekeeping community and top level scientists will take place in Ireland next year to discuss how scientific innovations can be applied within the beekeeping sector to halt this decline.

The International Bee Health Symposium, the first of its kind, will feature roundtable discussions between beekeepers and leading scientists with the aim of transferring knowledge between the two groups, creating practical solutions to dramatically reduce colony loss.

The topics of discussion will include:

- Varroa
- Foulbrood
- Nosema

To find out more and to register for the meeting, please visit: www.beehealth2012.ie Or email the Symposium Secretariat on: beehealth2012@mci-group.com.

NICK'S NEWS
from DPI NSW

Nick Annand
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The troubles with the *Apis cerana*, better known as the Asian honey bee (AHB), in North Queensland continue. Beekeepers are persisting with their push to get the eradication program re-instated rather than the containment program that is currently being implemented. Volunteers from the beekeeping sector are still travelling up to help with the program. With calls for more volunteers, anyone wishing to help should contact Bill Weiss on 6732 1263 or email: beeweiss @gmail.com.

Recently a report prepared for the Department of Sustainability, Environment, Water, Population and Communities was made available to the public. It looks at the evidence regarding the possible environmental impact of the Asian honey bee in Australia and is called '**ASIAN HONEYBEE Possible Environmental Impacts'**, written by Anna J. Carr. To obtain the full report simply Google on Anna J Carr and click on Asian Honeybee.

In this article I will attempt to summarise and make comment on the report. Where the writing is in **bold** this identifies the report headings.

The **introduction** of the review outlines the purpose and how the review developed. The objectives were then compiled into four questions:

1) What do we know about Apis cerana - as a species, and in terms of their distribution, ecology, biology and incursion into Australia to date?
2) What do we know about other bees 'ecology, biology, etc.?
3) What do we know about Apis mellifera impacts on the Australian environment?
4) How do the species compare/interact and what can we learn about the comparison regarding potential impacts on the Australian environment?

These objectives followed and were reported against 4 key actions of; consult, search, analyse and report.

The report describes where **Apis cerana (Asian honeybee - AHB)** fits into the Super family Apoidea (bees), being one of nine species within the sub group of Apis (honeybees). It points to the fact there is variation within the species with the bee in Australia being of the Java genotype. The report points out that care should be taken when interpreting within the species of AHB due to the differences between genotypes in its biology and ecology across its native range.

The **distribution and description** of the bee is provided showing its presence through most of Asia from Japan to Indonesia and west to Iran and Afghanistan. It has also been introduced into Papua New Guinea (PNG) and the Solomon Islands.

It explains that the AHB is usually smaller than the European honeybee – EHB but this can vary between genotypes with variation within both species.

The **ecology and biology** of the bee are discussed focusing on foraging preference and behaviours and the relationship between AHB and EHB. It is observed that in different situations either bee can be dominant over the other.

It discusses the variation in AHB colony sizes and abundance observing that their colonies are usually smaller than EHB colonies. The AHB has been observed to start flying at lower temperatures, earlier in the morning, and earlier in the season than the EHB but again it may be reflected only in some genotypes of AHB.

The EHB **defence behaviours** are considered more aggressive than the AHB. However the AHB have a few unique defensive behaviours including abdomen shaking, hissing when the colony is knocked or interfered with, and grouped defence through "mob capture" used for defence against hornets/wasps.

The **flight patterns and swarming** section describes the more erratic and rapid flight pattern of the AHB and the smaller foraging range of up to approximately 750m but usually within 300m. The report suggests findings vary greatly regarding frequency of swarming that suggests both local conditions and genotype may be major influences. Interestingly in Taiwan the AHB is reported to seasonally migrate between the mountains and the flats each year.

The AHB nesting cavity sizes are reported to be as small as 4.5 litres with a brood nest temperature maintained between 33 - 35.5ºC. The report discusses the mites found on Apis in Asia with the AHB being the host of varroa with different species of varroa living on different AHB genotypes. The *V. jacobsoni* is found on the Java strain of AHB. It also raises the recent finding that *V. jacobsoni* recently jump host and is now capable of breeding on the EHB in PNG.

The history of **incursions** or potential incursion is examined, pointing out that AHBs have been intercept numerous times on vessels heading to Australia from PNG. Another incursion of AHB to mainland Australia was detected and destroyed in Darwin in 1998 with only the one colony ever found.

A map of the possible spread and density of colonies of AHB across eastern Australia has been produced using CLIMAX modelling by Biosecurity Queensland.

The report then discusses **"other bee species in Australia"** to provide basic descriptive information to assist in comparing these species with the AHB and how the AHB may impact the Australian environment.

There are over 1500 species of **Australian native bees** of which most are solitary, coming in many varied sizes and colours. Of these there are 10 known species of stingless social bees. All native bees play an important role in pollinating in the Australian native ecosystems.

The report discusses ***Bombus terrestris* (bumble bee)** and its spread through Tasmania since its identification back in 1992 and the potential problems it could cause if it gets to the mainland.

It looks at ***Apis mellifera* (European honeybee** – EHB) since its introduction back around 1810-1820 and the resulting spread throughout much of the Australian landscape.

The report examines the **"environmental impacts of exotic bees"** pointing out the impact of exotic bees, particularly EHB, is poorly understood compared to the understanding on the positives of bees in agricultural production. Both the EHB and the bumble bees are listed as key threatening processes to biodiversity in NSW. The report points out that the impact of feral EHBs is controversial and is suspected to include competition with native fauna for flora resources, nesting sites and inadequate pollination of native flora and undesired pollination of exotic weeds.

The report then investigates "**interactions between honeybees and plants**", "**interactions between honeybees and vertebrates**" and "**interactions between honeybees and native bees**".

The **pollination and reproduction of native plants** pollinated by EHB may cause patterns of plant pollination that differ from the native pollinators but with little research done in this area and such a large range of native plants and variations between situations findings vary considerably. However there is more evidence of the EHB having a negative impact on native plant reproduction than there is positive.

The **pollination and reproduction of weed species** has been found to be enhanced by EHB and cause the spread of some exotic flora species. It is suggested that the plant that co-evolved along side a particular pollinator are best served by that pollinator.

Interactions between honeybees and vertebrates. The report discusses research looking at competition for food resources and nesting cavities between EHB and birds but there has not been any research examining the EHB impact on marsupial pollinators.

It then discusses **interactions between honeybees and other native bees** and that there is a large overlap in the floral resources used. The native bees are generally smaller solitary types that tend to forage at midday when the temperature is at its peak. The EHB tend to forage morning and evenings giving the EHB a competitive advantage to floral resources if available in the morning. The overall analysis of the interaction between EHB and native bees is that the evidence is inconclusive.

The **discussion** for the review points out that there is very little published evidence of the environmental impact of AHBs in Asia as it is part of the natural fauna.

The discussion then summarises the **differences between the AHB and other bee species** and the **environmental impacts of exotic bees.**

Likely impacts –asserted and observed are then discussed. With limited research on the environmental impact of AHBs the aim was to get feedback from a broad range of possible stakeholders to ensure all views were considered. Environmentalists and conservation groups' attitudes were sought but no freely accessible published material on this area was available so there views were not represented.

Some brief points gathered from industry stakeholders, such as AHBIC are provided, They state that Asian bees will take over nesting hollows of native fauna and the Asian bee will also compete with native fauna for nectar and pollen. Denis Anderson suggests the spread of the AHB through the Solomon Islands will have a major environmental impact that warrants further investigation.

The observations from the QLD outbreak are also considered with findings including, AHB nesting inside a tree snake nest site, in a bird's nest, inside compost bins, letterboxes, building sites and car tyre rims. It also pointed out that the AHBs are susceptible to predation by Rainbow bee eater birds, cane toads and green ants.

Hypotheses and questions. The report suggests more questions are raised than can be answered by the published literature, then goes on to list some of those critical questions.

It points out that both the severity and nature of the impacts of the AHB will vary depending on a range of variables and that most of the predicted impacts for future behaviour are based on conjecture and assumptions based on past studies and models.

The review states "although it does not conclusively establish evidence of harmful impacts from the AHB on Australian environments, it is clear that there are many reasons to be concerned about the potential impact of this invasive species."

Both **management recommendations** and **research recommendations** are then listed.

Nick's Views on the report

The review was affected by the fact that very little research and knowledge is available on the impact of AHBs on the environment. The only other two places to have had incursions in recent times are PNG and the Solomon Islands with neither having any comprehensive studies on the environmental impact of AHBs. So Australia will probably be the first to take records and do research on the associated environmental impacts caused by AHBs.

With little to no evidence on AHB environmental impacts and having to refer and compare the EHB environmental impacts, many of which are inconclusive, meant the report could really be nothing more than be quite conservative and cautious in its nature. It only reported on what evidence had been present to date. The comparison made between the EHBs impact as compared to the possible impact of the AHB is compromised by the many major differences that exist between the species.

Unfortunately the report provided no clear direction for immediate action to rid this potentially major pest but opted for caution. Such caution advocates a wait and see approach. So when we find out it does have major environmental impacts it may be well past any chance of doing something about it.


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UNITED STATES HONEY REPORT

Ron Phipps - CPNA International Ltd

Presented 26 September 2011 at the Apimondia World Beekeeping Congress in Buenos Aires, Argentina

We appreciate the invitation to speak at the Apimondia Roundtable during this important time. The American honey industry, as part of the international honey industry, has entered a period of tragedy/comedy. Where is Shakespeare to help untangle the prevailing web?

Honey Production in the USA

The year 2011 has witnessed extreme volatility, not only in global financial markets but in respect to the world of honey. Weather patterns in the US have been extreme, ranging from the swath of tornadoes and floods of the spring, the record breaking heat, drought and fires that have swept across Texas, the hurricanes and even an earthquake that affected 22 states on the eastern USA. The Dakotas had excellent winter snow that led to an abundance of clover and alfalfa blooms in the summer. But even there, July's excessive rains reduced the nectar flow leading to spotty yields of honey. California honey production was down about 30% with virtually no orange honey and a poor sage crop. Florida's orange honey and tupelo crops were also substantially below average.

As of the present there is no firm estimate of the 2011 US honey crop. High estimates are 160 million pounds (72,575 metric tons) and low estimates are 135 million pounds. Production in 2010 was 176 million pounds (79,833 metric tons), up 20% over 2009. The 200-220 million pound crops of past years have become a distant memory. US honey prices were up 9% in 2010, and are continuing strong in 2011. Consumption of honey in the US, despite increased prices, remains strong at about 400 million pounds (181,400 metric tons) per year.

Climate change models have predicted increased volatility and severity of global weather patterns. The weather events of 2011 do not contradict these predicted patterns. Beekeepers remain concerned about the vulnerability of their bees to various stresses including Colony Collapse Disorder. Another factor is the impact of global food inflation and persistent stress on energy supply. This latter factor has led to a macro-agricultural change in America comparable to that experienced in Argentina during the past decade. Vast stretches of pasture land that had supported dairy and cattle production have been converted to production of: 1) grains for export to India and China; and 2) bio-fuels to power an energy hungry globe. Many northern farmers prefer to raise such crops in the great prairie lands and then winter in the "sun belts" rather than tediously tend to their cattle throughout the year. This macro-change has reduced the amount of white honey, especially clover and alfalfa honey, produced in the USA. A chart showing US honey production during the recent decade illustrates the overall trend.

US Production & Imports 2001-2010 in pounds (lbs):

Year	*Production*	*Imports*
2001	185.5	144.8
2002	171.7	202.6
2003	181.7	200.4
2004	183.6	178.6
2005	174.8	233.0
2006	154.9	277.7
2007	148.3	233.0
2008	163.8	231.4
2009	146.4	210.5
2010	175.9	251.2

Source: USDA

US Honey Imports

The US was the number 1 honey importing country in 2008, according to FAO statistics indicating 231,400 pounds (104,962 metric tons). US honey import patterns have radically changed in the past few years. Imports from countries such as Indonesia and Malaysia have significantly declined or ceased in 2011, but quantities from India are now greater than those from any other country, reaching 50 million pounds (22,670 metric tons) for merely 8 months of 2011. The surge of honey from both India and Vietnam in 2011 has been unexpected. Some exporters from those countries have been put on import alerts by the US FDA. Imports from Argentina rank second, at 42 million pounds (19,000 metric tons). The US market needs a large amount of both industrial and light coloured honey and has taken in 194 million pounds (88,000 metric tons) this year so far.

Concerns about honey sources, following the recent criminal investigations, confessions and arrests, as well as a distortion of normal honey supply patterns, have led to efforts by True Source Honey, an organization established in 2011, to document the traceability of imported honey and ensure that honey imports are legal and of proper quality. It is clear that the US government is also acting to insure the safety of imported honey, and to investigate cases of customs and labelling fraud. Hopefully these efforts will lead to the end of a two-tiered market between legal and illegal honey, and between unadulterated and contaminated honey.

US Honey Imports
2000 compared to 2009 for several countries:

	2000 *Metric tons*	*2009*
China	26,819	67
India	0	13,137
Malaysia	0	9,068
Taiwan	27	5,576
Indonesia	0	5,124
Thailand	161	1,847

Antidumping duties are currently in place for Chinese honey in the US market. The high duties on Chinese honey depend on the use of third country surrogate analysis for calculation of the duty rate. China's surrogate country for honey is India. According to the terms of China's accession to membership in the World Trade Organization (WTO), in 2016 China's own economic data will be used to calculate antidumping duties, on the presumption that China will be a full "market economy" by then. This past week, the Chinese government began to petition Europe to recognize China as a market economy before 2016. If, and when, Chinese honey duties are reduced or eliminated in the US, the temptation for circumvention will be diminished. Some in the industry, however, fear a collapse of honey prices as a result. Chinese honey production in 2009 was 897 million pounds (406,000 metric tons), according to FAO reports. This suggests a potential powerful impact on the US market at which time the duty structure changes.

The real solution to maintaining honey prices that provide beekeepers with adequate remuneration to continue production, besides pollination fees, is to increase the demand for honey. The International Committee for the Promotion of Honey and Health was created by beekeepers, honey packers and importers to use good science as a marketing tool, as other industries have done. The international honey industry needs to devote more resources to developing such positive agendas which will elicit broad industry support and enthusiasm and benefit all segments of the honey industry and reduce the antagonisms and conflict that current affect the industry.

The American market is significantly affected by international factors such as currency valuation. The weakening of the Euro relative to the US dollar will restrain European buyers from being able to pay high US dollar prices for honey, as they have done in recent years.

GMO Pollen in Honey
The recent discussions in Europe regarding labelling of honey produced from genetically modified plants (GMO) has stirred a great deal of speculation, created technical issues for honey analysis and may result in re-evaluation of marketing strategies. Since a given lot of honey may have many types of pollen with different geometries and densities, the presence of pollen in commercial lots may be very heterogeneous, making sampling of honey more complex than presumed. If the GMO rule is rigidly interpreted, perhaps only 10% of the world's honey supply will be suitable for important consuming countries such as Germany. In Europe, Canada, the United States, China and Brazil there are hundreds of genetically modified plants which have been created to protect plants from disease, drought and other stresses and, thereby, ensure adequate global food supply for our planet with its huge population and its volatile weather patterns. Argentina has only 3 crops that are GMO plants. Table honey must be labelled as containing GMO if only 0.9% of the pollen can be traced to GMO plants. Honey which is filtered in such a way that pollen is removed must be labelled accordingly as "filtered" or "ultrafiltered" in Europe.

One possibility is that Argentina and Brazil will be unable to ship to the EU. If that happens, it is argued, Argentina will ship more to the US, possibly at lower prices. Another possibility is that the GMO ruling will create an upward surge in honey prices, as supplies will suffer a severe restriction. Certainly, the industry prefers price stability over speculatively driven volatility. We anticipate that greater clarity will be provided within the next several weeks.

There are reports that the ban on Indian honey exports to the EU will be ended by November 2011, and that those Indian exporters with good traceability and quality control will be able to resume shipments to the EU, diminishing their temptation to flood the US market with either circumvented Chinese honey or pure Indian honey.

A more stable and predictable honey market will be promoted if honey producing countries, including China, Argentina and India can ship to all consuming nations. But we need markets that are not only open but fair and legal in order to ensure continuity of supply and reasonable prices that allow honey to compete with other sweeteners.

Honey Standards
The raging European problem with GMO labelling points to the need for reasonable and science based standards for honey. As much as we may wish it, like other food products, honey does not exist in a realm of ultra purity. This is because bees are not invulnerable to disease and farmers must protect bees, like cattle, chicken, hogs, shrimp and other crops. Honey is produced from the interaction of botanical and zoological life forms and the conditions in the botanical world and the general environment find expression in the world's honey supply. Because of these fundamental facts, the international honey industry needs more scientific cooperation, realism and reasonableness and an objective assessment of health risks in establishing tolerance levels and detection limits. Apimondia can help bring international coordination and consistency. In an increasingly globally integrated economy, and given the WTO's opposition to non-tariff trade barriers, the international honey industry needs greater uniformity. The GMO issue illustrates the contrast in how honey is treated in different major markets. Major exporting countries such as China, Argentina, Mexico, Canada and Brazil will need to work closely with consuming countries in these matters.

Demand for Honey
Honey, like tea, does well in a recessionary economy. Purchases of food, unlike purchases of cars and homes, cannot be delayed for long periods. Indeed, "small luxuries" do especially well during periods of national economic stress, like the Great Recession facing advanced western countries, which are riddled with mounting deficits and debt. A good indication of the fact that current demand for honey exceeds supply is provided by the fact that as American beekeepers complete the extraction of the 2011 honey crop, that crop is being sold to eager buyers.

CLEMSON FUND

Thank you to the Hunter Valley Branch for their generous donation of $300.00 to the Clemson Fund and another $50 from B & E Sidoti (apparently Paul Drew, Sydney Branch, wouldn't accept payment for removal of a swarm from their home so it was forwarded to the Association).

Branches are reminded that donations to the Clemson Fund assist the Association in bringing international speakers to Conference.

We are holding our Centenary Congress in 2013 and hope to invite several international speakers to attend so all donations to the Fund will be put to good use.

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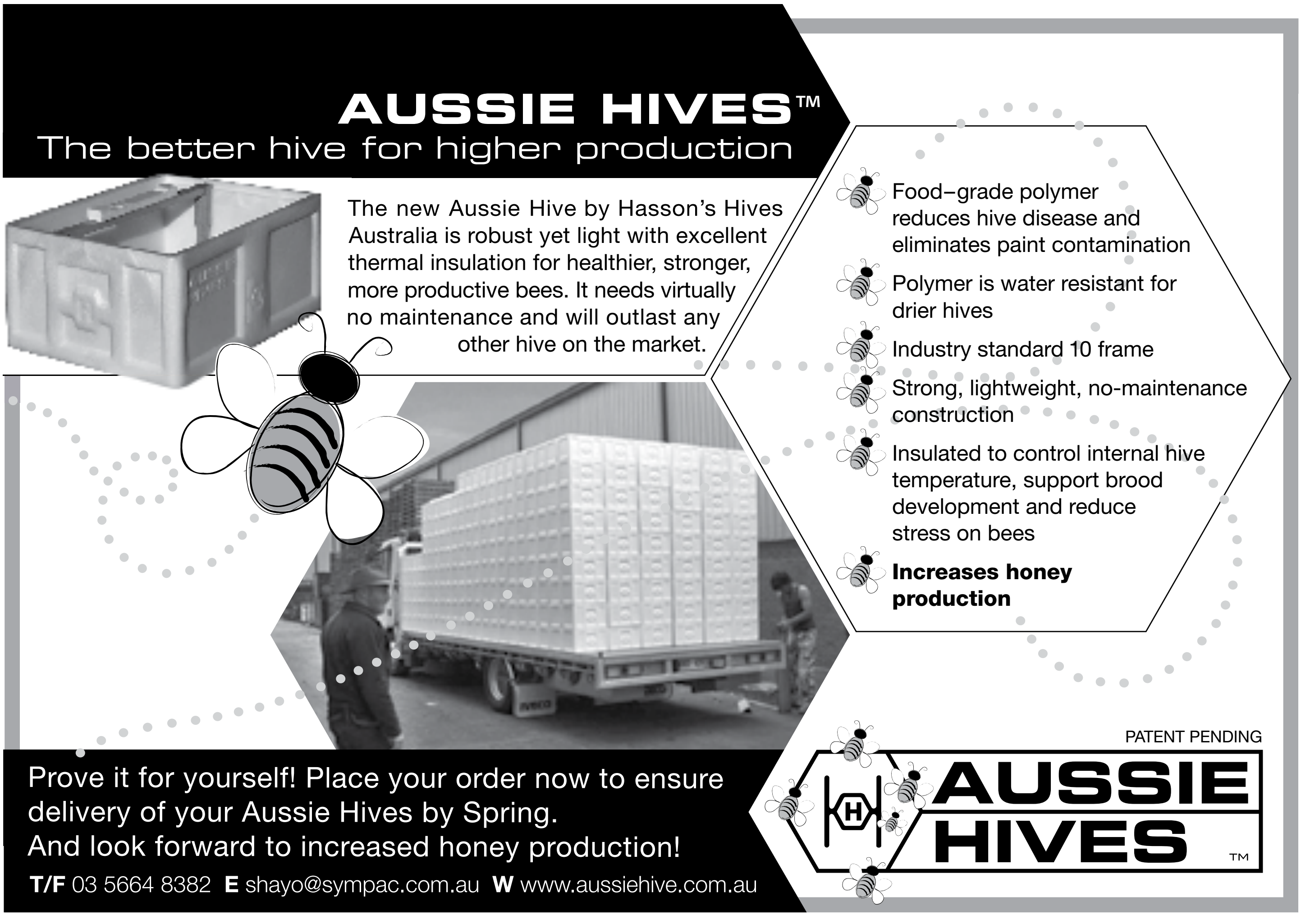

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VOLUNTEERING IN CAIRNS

by Bill Stratton

It was a wonderful experience to get the opportunity to go to Cairns to assist the Biosecurity Queensland team in their containment program of the Asian Bee (*Apis Cerana*). I visited places I never dreamt of whilst in that part of Queensland.

For the first week 8 -12 August our group of volunteers were Bill Oosting, Neville Smith, Reg Marsh, Chris Porter and myself, the second week 15-19 August, the volunteers were Bill Oosting, Neville Smith, Kayle Findlay, John and Judy Midgley and myself.

I feel it is benificial for volunteers if they can stay for two weeks rather than one, as it helps gets a better feel for what is going on up there. Neville Smith and I volunteered to be on call the middle weekend 13 & 14 August, what an experience, finding our way around Cairns and responding to a call out to a swarm at Brinsmead on the Saturday afternoon.

Bill Weiss supplied a people mover vehicle for the volunteers to use to get around and to go to and from work, also pick up and deliver volunteers to and from the airport. It performed very well and was quite economical to run. We used it on the weekend to sightsee around Cairns. Bill Weiss should be thanked by all for his generous contribution to the containment program.

The accommodation at the Koala Resort in Lake Street as provided by the FCAAA, is quite adequate and very central to Cairns City centre. There is also a night market close by where we ate most times, at very reasonable prices. Volunteers could also cook their own meals in their flat, as previous volunteers had left two new electric frypans and quite a large stock of supplies to be used. There are also BBQ facilities at the resort available to volunteers.

I would like to encourage all beekeepers to go to Cairns, make a difference with their presence and assist Biosecurity Queensland staff, trying day in and day out, to tackle the problem at hand. It will be too late to complain if and when *Cerana* is on our doorstep, encroaching on our businesses, while we have not done anything about it.

If the program is still going in the new year, my wife and I will be volunteering and going back to Cairns for another two week stint.

Apis cerana swarm on palm frond

FUTURE POST-ENTRY QUARANTINE 'SUPER STATION'

On 5 August 2011 the General Manager, Operational Resourcing & Infrastructure Quarantine Operations Division of DAFF announced that five quarantine stations for livestock, bees, birds, domestic pets and plants will be consolidated at a single site in Victoria.

The new site, which will cost more than $30 million, will replace existing facilities at Eastern Creek in Sydney, Spotswood and Knoxfield in Melbourne, Byford in Perth and Torrens Island in Port Adelaide.

The Government has not disclosed the location due to procurement confidentiality reasons.

According to a site plan on the department's website, the new facility will include 80 horse stables, 240 cat enclosures, 400 dog kennels, six bee flight rooms, the capacity to house 2000 caged birds, two greenhouses and laboratories for imported plants, and a 1200sqm cattle shed.

The plan to replace five stations with one 'super station' has met with criticism from some quarters of industry, with calls made to at least establish a tropical quarantine facility in addition to the planned temperate climate facility.

BEES' ROYAL JELLY SECRET REVEALED

by Michael Marshall

There's more than one way to turn a commoner into royalty. Honeybees create queens by feeding their larvae royal jelly, the secret ingredient of which has now been identified.

Masaki Kamakura of Toyama Prefectural University in Imizu, Japan, stored royal jelly at 40°C for 30 days, feeding it to bee larvae at intervals. Its regal effect gradually weakened, suggesting the key ingredient was decaying. He then fed larvae deactivated jelly with each batch laced with a different compound that was subject to decay. Only one caused the larvae to turn into queens: a protein Kamakura calls royalactin.

To find out how royalactin works, Kamakura added it to the diet of fruit fly larvae. This made them grow larger and lay more eggs, as in bees. Kamakura found that royalactin works by switching on the gene that codes for Egfr, a protein found throughout the animal kingdom.

This suggests a pre-existing mechanism was repurposed to produce the bee caste system, says Francis Ratnieks of the University of Sussex in Brighton, UK. When insects first formed eusocial colonies, queens and workers must have been physically identical, he says, and the distinct castes came later, created by royalactin or something like it.

NEW SCIENCE
Journal reference: Nature, DOI: 10.1038/nature10093

SICK BEES

by Randy Oliver - ScientificBeekeeping.com
First published in American Bee Journal September 2010

PART 4

IMMUNE RESPONSE TO VIRUSES

Viruses are obligate intracellular parasites that infect all organisms, from bacteria to humans. Their evolution represents a constant arms race with the host: Viruses need to reprogram host cells in order to produce progeny virus, but this is often successfully limited by the host antiviral defense, which in turn is frequently targeted by the virus, and so forth (Rehwinkel 2010).

A puzzling aspect of CCD is that when bee samples are analyzed, the "normal" immune mechanisms do not appear to be mobilized, despite the fact that the bees are rife with infectious pathogens (Johnson 2009). What could possibly cause such a suppression of the bee immune system?

If you'll look back at the bee immune system diagram in my last article, you can see that the ***induced*** bee immune response—the production of antimicrobial peptides—is dependent upon the upregulation of certain genes. Both this process and the bees' antiviral RNA response take place at the molecular level of gene expression. Certain pathogens, notably viruses, are able to sabotage this pathway.

Bees vs. Viruses
Viruses are the ultimate parasite—stripped to the absolute minimum. They are nothing more than encapsulated strands of genetic instructions. They are incapable of life on their own, being entirely dependent upon somehow getting into a host cell and hijacking the cellular machinery in order to trick it into producing more copies of the virus. They are so insidious that the line between host and parasite becomes blurred (about a twelfth of the human genome is viral in origin).

Surprisingly, this insinuation of viruses into host genomes appears to often confer evolutionary benefits, such as the introduction of new genes, or the acceleration of evolutionary change. Viruses may cause the extirpation (local extinction) of species, but any host that develops resistance to a strain of virus is then endowed with a competitive advantage over others that do not have such resistance (such as in the case of European human invaders to the New World, whose viral diseases decimated the Native Americans).

Bees are host to at least eighteen viruses, nearly all being single-stranded RNA viruses. Some, such as Sacbrood virus have been with us for some time. Others are "emerging" pathogens—both Deformed Wing Virus (DWV) and Acute Bee Paralysis Virus (ABPV) were once considered to be "economically irrelevant" (Genersch 2010), then, with the arrival of varroa as a vector, they began to devastate colonies, and are still strongly linked to collapsing colonies today (Highfield 2009, Evans 2010, Hunt 2010).

Each time a virus mutates, or shifts hosts between bee or other insect species, it can suddenly cause epidemics as it spreads through a "naïve" population, just as new strains of flu virus can spread through the human population. For instance, Thai (or "Chinese") Sacbrood Virus has caused massive collapses of colonies of *Apis cerana* as it spread from Guangdong Province in 1972 to the whole of China and Southeast Asia (Verma 1990). Indeed, as this article goes to press, Dr. Jerry Bromenshenk's team is on the cusp of announcing that they have found strong indications that there may be a novel virus involved in CCD collapses in the U.S.

Back to School
The genetic blueprints for a bee are carried in its DNA, which are essentially sets of coded instructions, coiled into long strands called chromosomes, which reside in the nucleus of every cell. The coding elements are called "genes," of which bees have perhaps 20,000—about the same number as humans! Scientists are working to better understand the bee genome—about 50 laboratories worldwide are currently focused on molecular analyses of honey bees, as bees are a perfect experimental organism, since they are relatively simple, well studied animals, yet exhibit complex behaviors and unusual aging aspects.

The "action" of a virus infection takes place largely in the ribosomes—the organelles in the cytoplasm of each cell that "read" the genetic instructions on messenger RNA, and translate them into actual proteins. I'm introducing these terms because I feel that they are important if you wish to understand what is happening in collapsing colonies. If your eyes are starting to glaze over due to the use of "Big Words," please take a deep breath, and don't let the jargon scare you—it'll be worth the effort to get a grasp of what exactly is failing in the bee immune system. I understand that it's been a while for many of my readers since biology class, so please bear with me, and allow me give you a little refresher.

A picture here may be worth a thousand words.

(Figure 1)

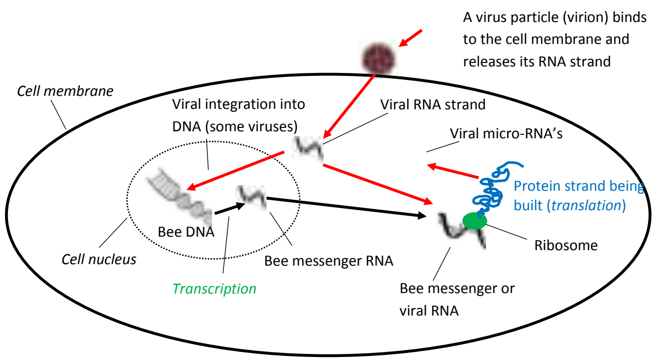

Figure 1. A greatly simplified diagram of how a virus insinuates itself into the genetic mechanisms of a bee cell. The bee's genes, encoded in its DNA, must be ***transcribed*** into messenger RNA, which act as couriers to carry the instructions out to the ribosomes (**black arrows**). The ribosomes then ***translate*** the instructions into the actual proteins and enzymes which do the cellular work. If a virus invades the cell (**red arrows**), the cell treats the viral RNA just like its own messenger RNA, and produces viral proteins or micro-RNA's, which then hijack the normal cellular processes. Components are not to scale. DNA strand graphic from Darryl Lija (NHGRI); virion from Wikipedia.

Until the advent of varroa, little attention was paid to bee viruses, and until very recently no one had any idea how the bee immune system fought viruses. The insect immune system is often chauvinistically dismissed as being more primitive than that of humans, since insects do not produce antibodies. However, insects have been surviving the attacks of pathogens since long before humans walked the Earth—they just do it a bit differently.

The bee antiviral response is based upon an ancient mechanism first discovered in plants (for an excellent history see Matzke 2004), but now known be common to virtually all forms of life—***RNA interference*** (RNAi). RNAi "silences" the expression of genes between the transcription of the genetic code and its translation into functional proteins.

There are many "Big Words" related to this subject. Scientists therefore us a lot of acronyms, which can be confusing to the first-time reader. Below are definitions of the acronyms used in this article.	
CCD	Colony Collapse Disorder—the definitive "symptom" being the often sudden disappearance of the adult bees, relative to the amount of brood present.
DNA	The double-stranded genetic blueprints (genes) for the function of an organism; carried in the chromosomes.
RNA	The single-stranded transcription product of DNA.
mRNA	Messenger RNA-- carries genetic code from DNA to the ribosomes for translation into proteins.
miRNA	Micro-RNA. Regulate the expression of genes, and thereby cell function.
RNAi	RNA interference. Used in "gene silencing" and antiviral immune response.
dsRNA	Double-stranded RNA. A temporary step necessary for the replication of RNA viruses.
siRNA	Short (or small)-interfering RNA. Short strands of RNA formed by cleavage by the Dicer enzyme. The critical component of the bee antiviral response.
DWV	Deformed Wing Virus
KBV	Kashmir Bee Virus
IAPV	Israeli Acute Paralysis Virus
ABPV	Adult Bee Paralysis Virus
I am also taking liberties with some terms. The term "symptoms" properly applies only to subjective sensations reported by a patient, whereas researchers observe "signs" of a disease in animals. The term "epidemic" only applies to human diseases; however, I'm using it anyway for bees, rather the proper term, "epizootic."	

The bee immune system exploits a quirk of typical viruses—that they are single-stranded RNA viruses (similar to human cold viruses), ***whose RNA strand can be directly translated into proteins by the ribosomes***. First we must better understand exactly how an RNA virus infects a cell (please refer back to Figure 1).

1. The typical bee virion "recognizes" a specific type of cell (typically gut cells, then later brain or salivary gland cells) by its specific "receptor" proteins on the cell membrane surface, to which they bind.
2. Once bound to the membrane, the virion releases its RNA strand into the cell cytoplasm (cellular fluid).
3. The cell's ribosomes mistakenly recognize the virus RNA strand as normal messenger RNA, and translate it into a long "polyprotein," which is then cleaved into functional virus proteins and micro-RNA's. These in turn suppress the bee immune system, and hijack the ribosomal translation functions to produce (or direct the formation of) the components necessary to form new virions (the protein coat, etc). At this stage, there is little direct antiviral response to the virus, and it is not yet replicating (yet it can still greatly harm the cell).
4. Finally, the virus needs to have its RNA strand replicated in full, in order to have it packaged into new virions (the assembly of which is directed by translated viral enzymes). To do this, the viral proteins produced by the cell use the original viral "sense" RNA strand as a template, and produce a mirror image copy ("antisense" strand) along it. At this point, there now exists for the first time a ***double-stranded virus RNA***.
5. ***If not suppressed by the bee immune system, the cell will then produce thousands of copies of the virus within hours!*** (For further reading, I recommend Roizman 1996).

Critical to the bee immune suppression of viruses is that t***he bee cell immediately recognizes the temporary double-stranded RNA's as being foreign***, since they are not normally produced in normal cellular translation processes. At this point, a picture is again worth a thousand words (Figure 2).

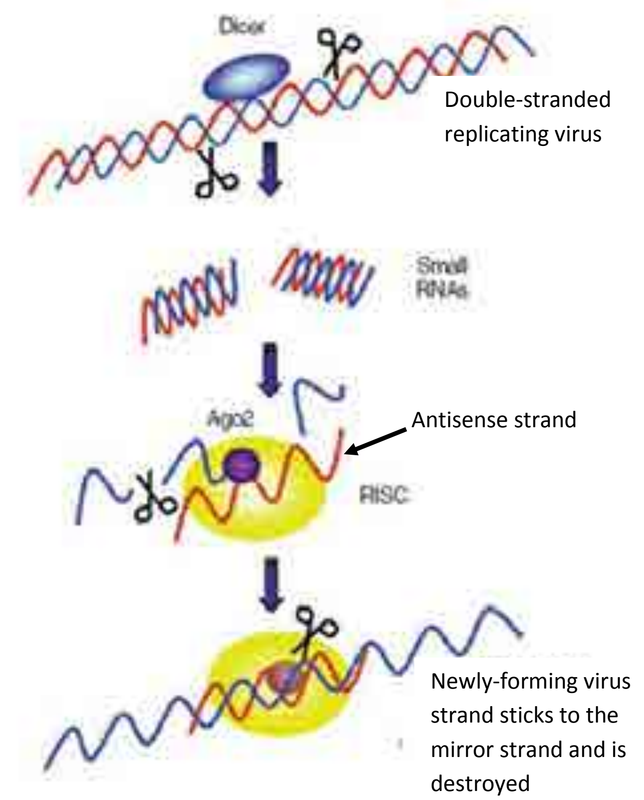

Figure 2. A greatly simplified illustration of how the RNA-silencing-based antiviral response works. In order to replicate, the single-stranded RNA viruses must rely upon the host cell to make copies of them. This process requires the temporary formation of a double strand of the virus--the "sense" strand acting as a template for its mirror image, the "antisense" strand). The bee cell contains enzymes called "Dicers" that immediately recognize the double-stranded RNA and cleave it into short pieces (siRNA--"small-interfering RNA"). These small pieces are then transferred to Argonaute (Ago) proteins, which bind to the single antisense strand of the chopped up virus RNA, thus forming the "RNA-induced Silencing Complex" (RISC). The bound strand acts as a template that binds to other newly-forming virus strands, which Argonaute then destroys. This action prevents the virus from being able to replicate. Illustration courtesy of Seokyoung Kang (2008) by permission.

The above process is amazingly effective and quick.

It is remarkably clever in that the "diced" siRNA's, by being only about 25 nucleotides long, contain just enough code to be specifically identified as a foreign gene, yet are short enough to make it difficult for viruses to evolve resistance by slightly tweaking their genetic code (see MacRae 2006, which has some stunning graphics). Also of note is that RNAi only works on viruses that are attempting to replicate—if the virus simply "hides" without trying to copy itself, Dicer simply ignores it.

Even more important, is that for the RNAi response to be effective at the whole bee and colony level, the siRNA products must spread from an infected cell to other cells, and then to other bees. This appears to be exactly what happens in the bee colony. For the first step, bees produce a protein that ferries the siRNA products across cell membranes, so the immunity can spread to the whole bee (Hunter 2010). It has not yet been confirmed, but the guess is that they make their way to the jelly produced by nurse bees. Once in the jelly, they have been demonstrated to confer resistance to larvae that consume them (Liu 2010).

It was widely reported that honey bees possess fewer immune sequences than were found in other insects (actually, compared only to the mosquito and the fruit fly), but what is seldom mentioned is that bees "possess more RNAi pathway components relative to flies…, and because bees appear to more readily mount a systemic RNAi response than do flies…it follows that bees should be quite capable of battling viruses and arguably other pathogens through knockdowns based on double-stranded RNAs of pathogen expressed genes" (Evans/Spivak 2009). ***Notably, this form of response to viral attack is actually quicker than that of humans (Li 2004), and provides a long-term memory similar to that resulting from the antibodies produced in mammals.***

Now let's cut to the chase!

In one of the most intriguing CCD papers to date (Johnson/Evans/Robinson/Berenbaum 2009), the authors compared gene expression between bees from CCD colonies originating on both the east and west coasts to that of bees from healthy colonies sampled before the emergence of CCD. They found that:

"Overall, elevated expression of pesticide response genes was not observed.

"Genes involved in immune response showed no clear trend in expression pattern despite the increased prevalence of viruses and other pathogens in CCD colonies.

"Microarray analysis revealed unusual ribosomal RNA fragments that were conspicuously more abundant in the guts of CCD bees. The presence of these fragments may be a possible consequence of … viral infection."

Note that the results did not indicate that pesticides were the problem. More surprisingly, the bees' induced immune response was not upregulated, despite their sick bodies being rife with pathogens! What could cause such a suppression of the normal immune response? The answer likely is linked to their finding of those "unusual ribosomal RNA fragments."

The paper cautiously offered various hypotheses to explain the presence of the fragments, but one of the authors, May Berenbaum, was more candid in an interview (Yates 2009):

"The one consistent indicator of CCD across samples collected at multiple times and in multiple places was the overabundance of ribosomal fragments. …. viruses 'hijack the ribosome,' taking over the cellular machinery to manufacture only viral proteins."

What does she mean by this? Most bee viruses are classified as "picorna-like" viruses (pico = tiny, so "like the tiny RNA viruses" of vertebrates). Picorna viruses have an unusual way of hijacking ribosomal function. The ribosomes normally only translate messenger RNA that is marked with a "password" at one end. But picorna viruses have figured out a way to sneak into the middle of the ribosome without a password (Ongus 2006). So what they then do is to produce enzymes that remove the password from the normal bee messenger RNA's, so that they can no longer be read by the ribosomes! ***By doing so, they hijack the cell's ribosomes to produce virus proteins at the expense of bee proteins!***

Berenbaum continues:

"The loss of ribosomal function would explain many of the phenomena associated with CCD. If your ribosome is compromised, then you can't respond to pesticides, you can't respond to fungal infections or bacteria or inadequate nutrition because the ribosome is central to the survival of any organism. "

Take a moment to grasp the implications of the above. Bees infected by viruses can lose most immune function, as well as the ability to perform other metabolic functions, as a result of the viral infection!

Practical Application

Beekeepers will soon have at their disposal, from Beeologics, an antiviral medication that mimics the natural bee RNAi response. The product, Remebee™, is made by creating two discrete dsRNA components that are identical to "conserved" regions of the IAPV genome (Maori 2009; "conserved" means that all known strains of the virus have almost exactly the same sequence; one of the conserved regions is also found in the closely-related KBV and perhaps ABPV). This is the product with which I treated the colonies in the California trial that I described in "Sick Bees 2." I can now share with you some of the yet unpublished results (the results of the 2008 trials will soon be published).

Prior to the feeding of Remebee, some colonies already exhibited siRNA's for IAPV prior to us inoculating them with the virus (it had been previously confirmed that IAPV existed in some of my colonies). Of note, is that in the Florida trial, the non-treated hive with the highest natural siRNA levels before and after infection had the highest bee population (of the control group) at the end-point analysis. In contrast, the two control hives that had no siRNAs either before or after infection were either dead or were extremely weak at the end point. ***This finding indicates that colonies that are able to naturally ramp up an siRNA response to viruses are better able to survive.***

When fed to bees in syrup, enough of the product is absorbed into their gut cells so as to initiate the antiviral response: Bee Dicer proteins recognize the dsRNA as being foreign, and chop it up to create siRNA's, which then confer resistance to IAPV and KBV. It is noteworthy that in colonies fed Remebee, ***the diced siRNA's are not merely absorbed, but actually amplified by the bees, and still found to be present four weeks after the last treatment, which is a much longer-lasting effect than I expected!***

We fed the test hives Remebee prior to inoculating them with the virus cocktail, and then took samples two weeks after inoculation. After being infected, the siRNA levels increased dramatically in the hives that had been pretreated with Remebee, much more so than in the unmedicated control group***. It appears that treating hives with Remebee prior to virus exposure primes them to initiate a stronger antiviral response should they subsequently be exposed to the virus.***

I will show the graphs for colony survivability in an upcoming article, but would like to make an announcement at this time: ***Beeologics has gotten FDA permission to experimentally release Remebee to beekeepers. They are looking for some commercial beekeepers who would like to test the product in their operations this winter. You can contact Nitzan Paldi directly at nitzan@beeologics.com***

Viruses Fight Back

Viruses are unthinking strands of genetic code, so how do they deal with the bees' powerful RNA silencing immune response? The answer is that the viruses launch a preemptive strike by suppressing that immune response before it is initiated, and by further tweaking the ribosomal machinery to their benefit. This is akin to defeating an army by simply infiltrating its command headquarters and then rewriting the orders going out to the manufacturing sector, supply chain, and the troops.

Viruses are so good at this, that some species of wasps actually inject a specific virus into the caterpillars that they parasitize, in order to suppress the caterpillar's immune response against the wasps' larvae (Pruijssers 2006). Some insect viruses have even figured out how to prevent the last-resort immune defense of an infected cell—programmed sacrificial suicide (apoptosis)—allowing long-lasting "latent" infections! (Narayanan 1998).

This is cutting edge science, not yet thoroughly understood, but great strides are being made. Any papers or texts more than ten years old are likely out of date! The deeper I've looked into it, the more fascinating and complex it becomes, as we begin to grasp the tactics in the virus/host never ending "game" of suppression of the suppressors of the suppressors. Allow me to quote Scaria (2006):

The exclusive dependence of viruses on the host cellular machinery for their propagation and survival also make them highly susceptible to the vagaries of the cellular environment like short RNA mediated interference. It also gives the virus an opportunity to fight and/or modulate the host to suit its needs. Thus the range of interactions possible through miRNA-mRNA cross-talk at the host-pathogen interface is large. These interactions can be further fine-tuned in the host by changes in gene expression, mutations and polymorphisms. In the pathogen, the high rate of mutations adds to the complexity of the interaction network.

The last point of the above quote, about the high rate of viral mutations is of great import. The RNA viruses are notable for their high mutation rate. ***Even the change of a single base molecule on the RNA strand can have a dramatic effect upon the virulence of the virus!*** (Shiboleth 2007).

What we beekeepers observe in the field is the year-by-year evolutionary process in action, as some colonies fall sick with odd symptoms, then see the population rebound as resistant survivors supplant the less fortunate. The bee/virus interaction becomes a sort of interactive game, played at the genetic and ribosomal level, but unfortunately observable only with specialized laboratory equipment. It is only recently that scientists even knew what to look for!

Sick pupae, typical of a virus epidemic as varroa levels peak in September. Best I can tell is that they are dying from DWV or perhaps other viruses. I see this generally happening if the mite infestation reaches about 10% (30 mites in an alcohol wash of ½ cup of bees from the broodnest). I started noticing these sort of symptoms several years ago, and am seeing more this year than ever!

This photo is of a small patch of intense infection in one brood frame; in the rest of the hive, sick pupae and larvae were more scattered.

MicroRNA's

In the past decade, researchers have discovered that there are a whole set of genetic instructions whose functions had been previously overlooked. These are the genes that code for ***micro-RNA's***, which like messenger RNA's are shuttled from the nucleus to the ribosomes, but there, instead of coding for proteins, ***act as regulatory instructions*** for genetic expression (microRNA's are an extremely hot topic in biology, and well reviewed in Wikipedia).

Scientists have only recently discovered that bacteria (Navarro 2008) and especially ***viruses (Scaria 2006) either produce micro-RNA's or target host micro-RNA's essential to the host immune system***. Realize that every type of cell (gut, brain, hemocyte) contains fine-tuned mechanisms to regulate the expression of each of the thousands of specific proteins needed for it to function. Viruses can muck up these mechanisms to their own advantage (Pacheco 2010). ***The end result can be that the bulk of normal cellular products become the sort of ribosomal "trash" found in the CCD study cited earlier.***

It may appear that I've made a strong circumstantial case pointing at one or more viruses, perhaps in synergy with nosema, as being the agents of colony collapse. The strongest smoking gun is that we were able to duplicate the symptoms of CCD in test yards by inoculating colonies with a virus cocktail from another beekeeper's collapsing hives, and that suppression of those viruses appeared to cause some protection. However, I already had at least some strains of those viruses (plus *N. ceranae*) in my (otherwise healthy) operation prior to the start of the trial, *and* one of the control colonies did not seem to suffer. So I must be cautious about solely blaming the viruses as the ***initiating causal agents*** of colony collapse. I also, want to be clear that in this article I have extrapolated the current state of knowledge of similar viruses to the bee model, and that further work needs to be done before we can say that we definitively understand what is happening.

Inapparent Virus Infections

There is some good news, in that it is generally not in the interest of a virus to actually kill the bee, as ***the main method of transmission for the most virulent viruses appears to be via live bees either by oral/fecal transmission, or as a result of being vectored by varroa mites***. The exception to this live-bee rule is when the mid-aged hygienic bees transfer virions from virus-killed brood to other bees (common with sacbrood and DWV, but not necessary for the transmission of either). (Less virulent strains of virus may also "vertically" transmit in semen or through a queen's infected eggs).

Of interest is that the most virulent bee viruses tend to exist in an "inapparent" infection—a term coined by Australian virologist Denis Anderson (1988)--meaning that one can detect the presence of the virus in bees, but that there are no noticeable negative effects due to the infection. Another Australian (Benecke 2007) explains: "It seems likely that bees carry the virus at all times but only show symptoms when they are stressed in some way. ***Thus bees may not so much 'catch' a viral disease but for some reason fail to suppress a virus they are already carrying***" [emphasis mine}.

So go back to my discussion of viral replication. The bee cell may ignore the virus so long as the virus doesn't attempt to actually replicate. ***The question then is what exactly triggers the sort of multi-virus epidemics typical in collapsing colonies? What are the causal agents, and which are mere opportunistic pathogens?*** I've already discussed some of the triggers--poor nutrition, chilling, environmental toxins, and parasite infection. Believe me, many researchers are working long, painstaking hours to try to be the first to figure out the specific cause or causes (the "etiology") of CCD (just read the "Methods" section in the following paper)!

In the most descriptive CCD paper to date, vanEngelsdorp, Evans, et al (2009), state that:

"While no single pathogen or parasite was found with sufficient frequency to conclude a single organism was involved in CCD, pathogens seem likely to play a critical (albeit secondary) role. CCD colonies generally had higher virus loads [higher titers across the board; KBV was especially prevalent in sick colonies] ***and were co-infected with a greater number of disease agents than control colonies"*** (55% of CCD colonies were infected with 3 or more viruses as compared to 28% of control colonies).

So what happens when there are multiple parasites suppressing the bee immune system at the same time, and screwing with their ribosomal functions? I will continue on that subject in my next article.

Acknowledgements
RNAi is cutting edge science, the explanations of which are often buried in very arcane scientific journals; I thank Peter Borst for his tireless ferreting out of related research. I greatly appreciate the assistance of several scientists who have given their time to help clarify things for me. First, the Israeli virologists Ilan Sela, who identified and named Israeli Acute Paralysis Virus, and his associate Eyal Maori. Through Prof. Sela, I was introduced to RNAi, and to Nitzan Paldi, the inventor of the Remebee concept, with whom it has been a great pleasure to collaborate. I also wish to thank virologist Wayne Hunter, who brought his expertise with insect viruses to the USDA bee lab, and was a co investigator with me for the Remebee trials. Finally, Jay Evans of the USDA lab, who has been a workhorse for CCD research and bee immune function, has always been there for me to bounce ideas against, and to whom we beekeepers all owe a debt of gratitude for his tireless efforts. I greatly appreciate the helpful reviews of the manuscript by Nitzan Paldi and Michelle Flenniken.

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"These articles were originally published in the American Bee Journal. All of Randy's bee articles may be found at: www.ScientificBeekeeping.com

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Executive Director: Mr Stephen Ware

The following is an update of recent activities of AHBIC if you should seek further clarification please do not hesitate to contact the AHBIC office.

AHBIC NEWS - SEPTEMBER 2011

B-QUAL

A meeting of B-QUAL was held in Brisbane on 16 September 2011 which was both a Director's meeting and the AGM of the company. In relation to the Annual General Meeting the incoming Directors are: Barry Pobke, Bill Winner and Ken Gell.

Mr Ed Planken, previously a Director indicated that he would not be standing for the year and we put on record our thanks for his involvement and contribution.

One of the key outcomes of the Director's meeting was a presentation to members of the Queensland Beekeepers Association who agreed to participate in a project to test Industry's previously designed Environmental Management Plan.

Funding has been granted by the Department of Environment and Resource Management (DERM). The Meeting discussed the issue of DERM funding and proposed project with B-QUAL. It was noted that the project outcome required by beekeepers was to test the existing Environmental Management Plan (EMP) that was developed in draft form in 2007. It was proposed under the project that the draft would be tested and beekeepers under the DERM Project would trial its implementation.

DERM's goal was to use the EMP which has energy, fuel and chemical components to enable beekeepers to establish a base-line data and action plan for improvement. This preliminary work within the Industry may lead to a Stage 2 project with honey packers.

Asian Honey Bee Coordination Group Meeting

The next meeting of the Asian Honey Bee Coordination Group will be held on Thursday, 6 October 2011.

This meeting (via teleconference) will discuss the progress of activities to date and a recently developed Asian Honey Bee Transition to Management (T2M) Plan.

At its meeting on 20 May 2011, the group noted that the Commonwealth would be contributing $2 million in 2011-13 for a national program aimed at assisting the community, land owners, industry and apiarists to take actions to identify and manage the impact of Asian Honey Bees. The T2M Plan sets out how the Commonwealth funding will be allocated, in partnership with Biosecurity Queensland and the Australian Honey Bee Industry Council (AHBIC), which are also contributing funding. Other parties may seek to fund additional activities to complement those outlined in the T2M Plan.

Access of Beekeepers to National Parks

AHBIC sought and has received assurances from the Hon Tony Burke MP, Minister for Sustainability, Environment, Water, Population and Communities that beekeepers will not be affected by proposed Federal Government regulations to restrict high impact activities in National Parks. Minister Burke has indicated:

"*I have recently consulted with my state and territory colleagues to seek their views on extending the Environment Protection and Biodiversity Conservation At 1999 (The EPBC Act) to better protect those areas with high biodiversity and which State Governments have chosen to designate for land based protection such as National Parks as matters of National Environmental Significance.*"

"The proposed regulation would require particular high impacts activities: mining, logging, grazing of domestic stock or significant and inappropriate land clearing in protected areas to be assessed under the EPBC Act. It would not affect any existing activities. It would only apply where States choose to designate the land as a National Park and states would still have full control over the boundaries of National Parks. As beekeeping is not covered by any of the above mentioned high impact activities it would be unaffected by the proposed regulation."

AHBIC Executive Meeting

The next meeting of the AHBIC Executive will be held on Monday 31 October 2011 in Melbourne.

European situation regarding GMO pollen in honey

A recent court case in the European Union (EU) has put in doubt the requirements for exporting honey from where GMO crops are grown to EU.

The Department of Foreign Affairs and Trade (DFAT) and the Department of Agriculture, Fisheries and Forestry (DAFF) are concerned as to what the court decision means and that the European Commission would be required to respond to the judgement shortly so that the EU could make a decision. USA and Canadian honey may be more seriously impacted due to some of their crops not being EU authorised GM crops. It is unclear whether the GM decision is a breach of the World Trade Organisation.

The decision needs to be understood from an Australian point of view particularly given the proposed increase in GMO crop plantings.

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STICKY STORIES

The Museum of the Riverina is developing an exhibition on beekeeping in the Wagga Wagga area and we are looking for photographs and stories of beekeeping and beekeepers in the region.

We are also hoping to collect or borrow items and photographs of anything which reveal stories from beekeeping in times past.

If you are able to help the museum, please ring curator Genevieve Mott on 02 6925 2934 or email: mott.genevieve@wagga.nsw.gov.au

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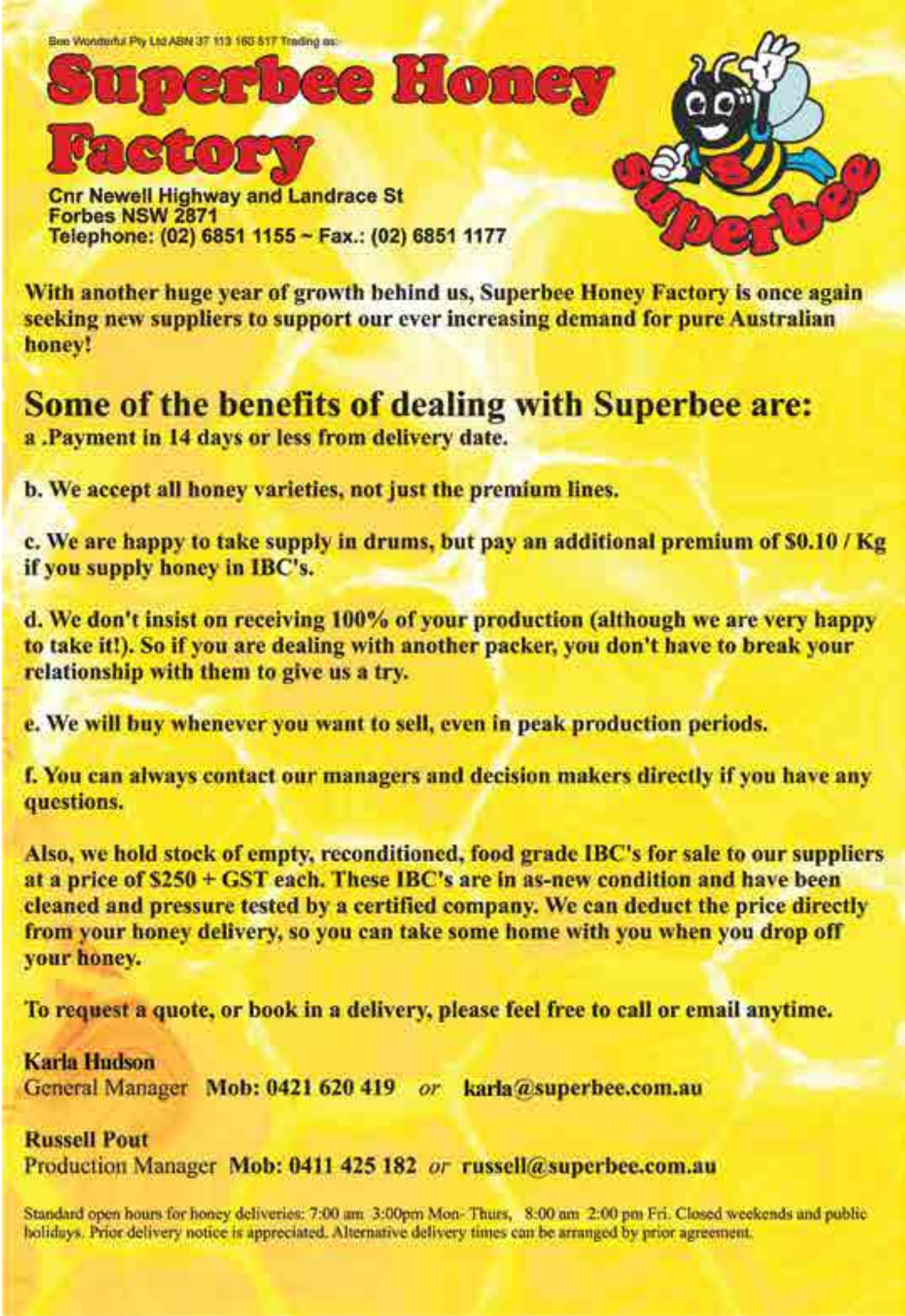

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