AUSTRALIA'S

HONEYBEE NEWS

"The Voice of the Beekeeper"

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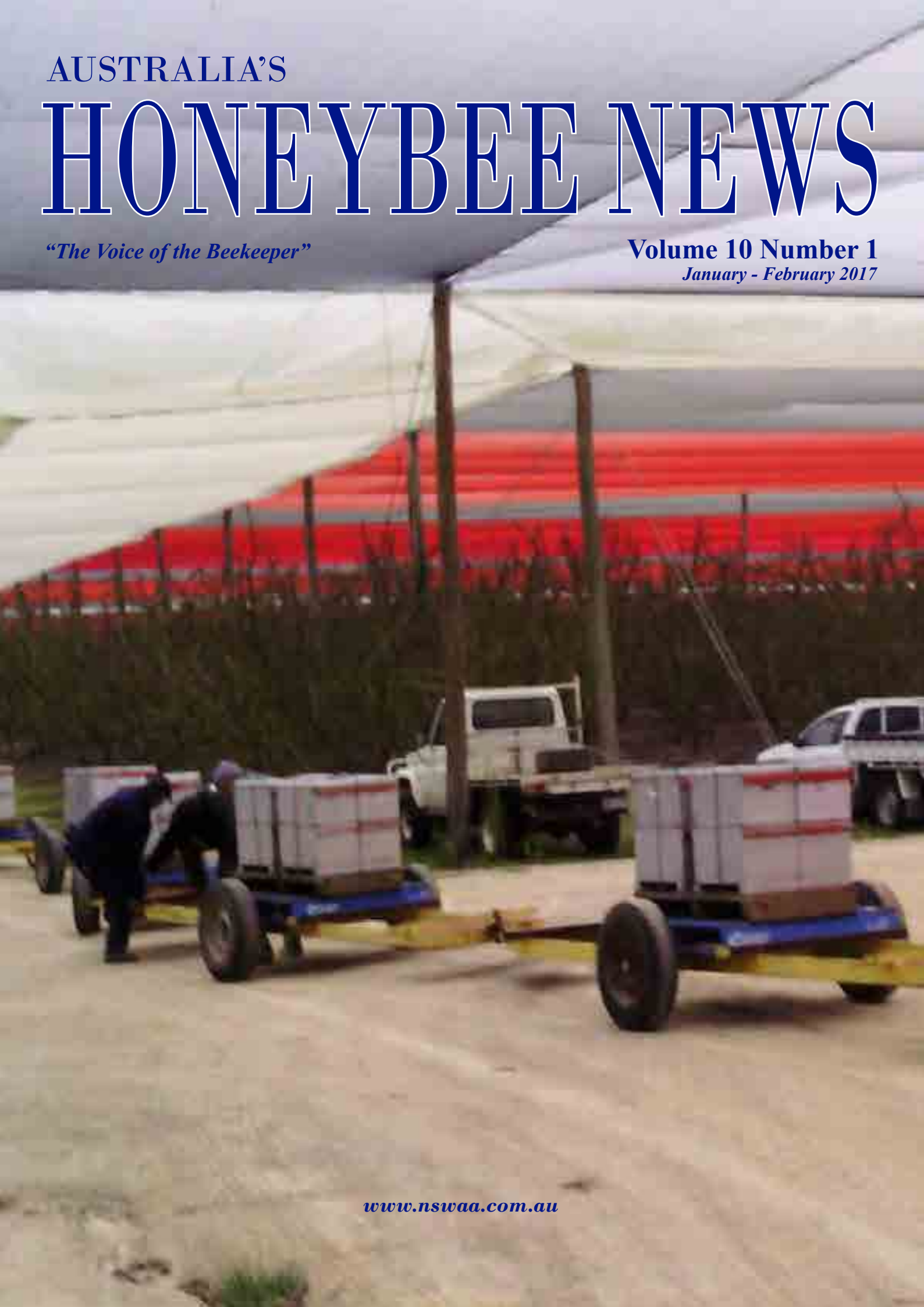

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AUSTRALIA'S HONEYBEE NEWS

The official Journal of the NSW Apiarists' Association (NSWAA) www.nswaa.com.au

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COVER: Bees being taken into an apple orchard for pollination which is under hail netting in Stanthorpe QLD PHOTO: Casey Cooper

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PRESIDENT'S REPORT

SEASON
Summer has not been conducive to honey production, with many areas of the State having well above average temperatures, coupled with a lack of rain. No significant quantities of honey have been produced across much of NSW. The only exception being the Northern coastal strip with some Brush Box produced. There are a few autumn prospects but with the current hot weather persisting nectar secretion may be limited. I don't expect any significant production before next spring.

BEE BIOSECURITY OFFICER [BBO]
It has been 3 months since our BBO left her position and still at 1 FEBRUARY the vacancy has not been advertised.

I have spoken with Chris Anderson DPI (Manager Plant Biosecurity Prevention and Preparedness) who informed me that because of the requested changes to the job requirements i.e. the removal of the requirement to have formal qualifications; this has delayed the advertising of the position. I hope this process doesn't drag on too much longer.

CONFERENCE
We have invited the Director General of NSW DPI Scott Hansen to open this year's Conference. We are hoping he can explain why the BBO position must remain at Orange and not at Tocal College with other Apiary educators and the future of the Apiary section within DPI, with regard to maintaining both Nick Annand's and Doug Somerville's positions after their respective retirements. Industry also requires an update on the appointment of a manager dedicated to the single desk for beekeeping access to Public Lands.

CONFERENCE SPEAKERS
We have at least one speaker lined up for Conference from overseas, Dannie Vorster is a commercial beekeeper in South Africa and will talk about his beekeeping operation and the South African beekeeping industry. We are trying to line up another speaker from the Northern Hemisphere to talk on chemical use in agriculture and its effects on honey bees.

STOLEN HIVES
It is disappointing to hear of reports of theft and vandalism of beehives. Details of a recent theft in the Tamworth area on a TSR goes to show that we need to be constantly vigilant. The role of surveillance cameras is likely to become more important in the future. This also highlights the vulnerability of apiaries located on Public Land sites. As the Government recently increased Public lands sites up by at least 50%, it may become more attractive to seek out more secure private land sites where available. Please report all thefts no matter how minor.

MINISTER
It is pleasing to see Minister Blair retain the Primary Industries portfolio as he has historically expressed his support for the apiary industry. What is of concern is we now have a new Environment Minister and a new Minister for Lands and Forestry. Forestry have proven to be increasingly difficult to deal with.

A meeting with the two new Ministers will be arranged as soon as possible to ensure that they are familiar with our industries issues and how their departments have the potential to impact on our industry.

PUBLIC LAND ACCESS
There is a separate note on where we are at with this project published in this edition. This update has been provided by NSW DPI. We hope to have someone from NSW DPI attend Conference to cover this issue, even if the Director General can't attend.

SECRETARY
Our recently appointed secretary Ros Riggs is settling in well, albeit having to contend with numerous transitional problems, computers, internet etc. Ros has coped extremely well and delivered on all that has been required to be done. Thanks Ros.

BIOSECURITY ACT
NSWAA submission to Draft Biosecurity Regulation 2016 (key points):

- Alignment and limit registration to 2 years rather than the proposed 5 years
- Free registration ONLINE ONLY for 1-10 hives.
- Up to 100 hives - $50, up to 500 hives - $100, over 500 hives - $200
- Apiarists update hive numbers at registration renewal
- Completion of a relevant course that meets the requirements of the industry biosecurity code must be undertaken prior to renewal of registration
- Nuisance Bees – Biosecurity Impact and Public risk
- This mainly refers to bees being moved in the heat of the day
- Bees left behind while being transported i.e. at a public place such as a service station - Industry has formulated a code of practice on a national basis but this needs to be regulated
- Evidence provided such as service station surveillance video of truck with hives on board, bees congregating around lights and the registration of the truck would be very a very clear case for prosecution.
- American foulbrood – Prosecution needs to be considered for control to be effective and prevent major outbreaks.

COTTON AUSTRALIA
On 7 Feb a meeting was held with Cotton Australia in Sydney. In attendance from our industry were Trevor Weatherhead (AHBIC), Robert Dewar (President QBA), Harold Saxvik (Darlington Point Pollinator) Vice President Casey Cooper and myself.

Discussions revolved around communication strategies and how cotton growers and beekeepers can co-exist. Hopefully outcomes from that meeting will eventually translate into practical working relationships between both industries. Our main problem with the cotton industry is the continued use of harsh chemicals such as Fipronil. If cotton growers can be persuaded to move to softer more bee friendly chemicals then our concerns with the rapid expansion of areas sown to cotton will be minimised.

POSITIVE FARMING
NSWAA is holding a positive farming seminar on Wednesday 17 May the day prior to our Conference. Numbers are limited, so anyone interested please refer to the advertisement in this issue.

MARCUS OLDHAM
Each year NSWAA sponsors a position at the Marcus Oldham Leadership course. Anyone interested in attending this week long course, usually held in June/July, please contact our Secretary at: info@nswaa.com.au

NEXT MEETING
The next executive meeting will be held in Dubbo on 20 February.

Neil Bingley
State President

NEW MEMBERS

A warm welcome to the following new members:

Glen Groves	Dysart QLD
Andrew Matthews	Moree
Natalie O'Keeffe	Cattai
Andrew Reed	Manly
Rex Smart	South Tamworth
Malcolm Williamson	Wauchope

UPDATE FROM NSW DPI ON NEW POLICY FRAMEWORK FOR APIARY SITES ON PUBLIC LANDS

Work is progressing to finalise details of the new policy framework for apiary sites on public lands in NSW. Over the next two months, DPI will be undertaking targeted consultation with a range of beekeepers across the State to resolve remaining elements of the framework and ensure the way it is implemented meets beekeepers' needs. The consultation will focus on:

- how the proposed Expression of Interest (EOI) process for allocating new and vacated sites should be designed
- the functions of the online portal and related support services, and
- the position on permit renewals.

In addition to this, other key elements of the framework are progressing, including the economic analysis to inform future pricing and development of standard permit conditions.

Prior to finalising the framework, the outcomes of this work will be summarised and released for public consultation. Anyone interested in having their say will be able to do so via the DPI website. Further details will be available in March.

Please refer to the DPI website for further information and update: http://www.dpi.nsw.gov.au/animals-and-livestock/bees/policy-framework

CONGRATULATIONS

To Bryn & Lisa Jones on the occasion of their marriage on Saturday 4 February in Dubbo.

Combining two more beekeeping families.

Warren Jones (Father of the Groom), Lisa & Bryn, Wendy & David Mumford (Parents of the Bride).

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USING BEEBUILD TO IMPROVE YOUR BOTTOM LINE

We recently sold our highly profitable Manuka (Jelly Bush) Honey enterprise. The word "Manuka" is currently a point of contention between NZ and Australia with NZ claiming the name. But with a little research shows Australia can also give claim to the name. Manuka is a suburb of Canberra famous for its Cricket oval. Manuka is not only New Zealand in name but Aboriginal as well, the local Aboriginals would meet at Manuka to conduct special healing ceremonies. Manuka (the place) is a point where two geographical fault lines meet.

Ever since we built up our Manuka enterprise beekeepers have been asking what is the secret to producing Manuka Honey? The simple answer is Beebuild. A special scientific (www.beebuild.com.au) developed Pollen Replacement Supplement, high in amino acids including the 10 essential for European Honey Bees diet. NOTE DON'T BE CAUGHT USING CHEAP ADULATED CHINESE POLLEN - because the pollen grains are being found in the honey, adding to the New Zealand claims that Australian Manuka Honeys are blends. Bees consume, depending on hive strength, 1-2 kg of pollen per week, per hive.

When working Jelly Bush do not bring in strong triples, for they will eat your honey crop. A good double is my preference. Start feeding Beebuild the moment you put the bees down. This will enable the field bees to zero in on the Beebuild feeder. Do Not leave it go until the hive stored pollen has been used. Yes it can be an expensive exercise (Yet nearly half the price of imported Chinese Pollen).

Do a cost benefit analysis. Take in the cost to produce good bees, the expense to transport and deliver to site, getting bogged once or twice, this all adds up. Our sites were on loose white sand and the sinking feeling is one part of Jelly Bush production I won't miss. The labor cost x 2 men. We got to the stage where we left the bees on site all year round. This saved a lot of hard work.

This was our year: Winter (April to July): Wallum country- Tea Tree Heath, Sand Pea, Wild Flowers etc. August: *Leptospermum scoparium*, Sand Pea, Coastal Gum. September: *L. scoparium, L. polygalifolium*. October: *Leptospermum polygalifolium*. November: *Leptospermum whitei*. December: *L. whitei, Leptospermum liversidgei*, Grass Trees, Blue Berry Ash. January- late February: *L. liversidgei*, Saw Tooth Banksia.

As you can see there are other species flowering alongside the 4 main Leptospermum + 3 other Leptospermum species like *L. trinervium*.

Even with these other species Beebuild was always on offer, checked and topped up every week. As soon as the honey super was full it would be under supered and taken at the first opportunity. I found that on Jelly Bush you needed to keep your bees tight. If there was a dearth in production, we placed vinyl, or heavy black plastic over the brood nest with a 30mm gap all round to allow the bees access to top super. This helped the hive to conserve stores.

When you notice that things are improving you would remove the vinyl-plastic giving the hive, at the same time, a good couple of handfuls of Beebuild to kick start the hive again.

If the brood box starts to honey themselves remove the two outer frames of honey replace them with two good newly drawn brood comb, with Beebuild rubbed into them. Place these two comb 2 spaces in from the side wall. Do not place brood comb into honey super. Take it home with you (disease control). This may seem like a lot of work, but with the rewards - up to 12 times that of normal honey price, even blind Freddy could see the benefits.
Warning don't over stock the resource. We maintained half loads per site 50-60. Don't forget to requeen annually, March- February is an opportune time.

You may also need to keep a backup apiary, on good build conditions, to supply that bit of extra brood or that odd Queen or two that somehow goes missing.

Bee Race preferred. We have tried both Yellow and Black lines and found Blacks keep a tighter brood nest with good stores around the brood.

Take home message Bee Build works. Those who use it are able to produce large crops of honey on flowers which are known for Bee Number Collapse. Short life span -skinny bees not fat bees.

Acknowledgement
Dr D. Somerville, Dr R. Manning, RIRDC "Fat Bee Skinny Bee" *RIRDC Publication No. 05/054.* Dr C. Davies QDPI Food Science Lab., Mr. Peter Warhurst QDPI Apiary Officer, Mr. Thomas Harding Research Assistant.

Laurie Dewar OAM

UPDATE ON QUEENSLAND BEEKEEPERS HURT IN HIT & RUN INCIDENT

From: Queensland Beekeepers Association 11 January 2017

In December three Queensland beekeepers, Ray Clarke, Paul Reid and Ray's niece Samantha were hurt in a hit and run incident.

Samantha has recently taken a few steps. The surgeon has not given her permission to start rehabilitation yet on her shoulder, but is expected to start soon.

Paul is back in Warwick hospital after weeks in hospital in Newcastle. He is still unable to put weight on his legs. He is in good spirits but is not sure when he'll be mobile again. Doctors are not sure when he can start rehabilitation. Recovery is still unknown and it will be a long road. Paul appreciates the thoughts and well wishes of friends and fellow beekeepers.

Ray still has a sore knee but is glad of the team he has around him. He would like to extend his gratitude to everyone that has helped.

Please keep Ray, Sam and Paul in your thoughts and prayers.

DOUG'S COLUMN

Doug Somerville
Technical Specialist, Apiculture - NSW Department of Primary Industries - Goulburn
doug.somerville@dpi.nsw.gov.au

NSW FARMER OF THE YEAR AWARD

It was a privilege to see one of our beekeeping industry leaders in NSW make it to the 2016 finals of the NSW Farmer of the Year Award. The award commenced in 2004 and is designed to recognise excellence in farming within our state. While all aspects of the farming enterprises are scrutinised, there is particular emphasis on *acknowledging the achievements of farmers who are able to demonstrate a strong safe working environment with environmentally sustainable working practices while remaining in a profitable business environment*.

The award is supported by a range of bodies including NSW Department of Primary Industries, NSW Farmers, The Land newspaper and Safework NSW department.

Winning farming enterprises since 2004 have included mixed farming, beef cattle, sheep, tomatoes, cropping, blueberries, lucerne and goats.

In 2016 the process to select a farmer of the year started in July, when applicants were called for. Applications closed in mid-September. This was followed by the announcement of the finalists in October, after a due process by the judging panel. In 2016 the finalists were: Nick Arena, a fish farmer; Peter Matuszny, producer of free range eggs; Jock Nivison, beef and sheep enterprise; and Casey Cooper, our vice President of the NSW Apiarists' Association and beekeeper extraordinaire.

In December the four finalists were invited to a lunch in Sydney where the winner was announced. Suffice to say that Casey didn't take the main trophy, but what he did achieve was to highlight the beekeeping industry to a very large gathering of rural reporters and visitors. This sort of exposure is immensely important for the beekeeping industry. Nick the fish farmer took the honours for the day.

The information cards on the tables at the presentation lunch provided the following information about Casey.

Casey Cooper – Cooper Bees, Tingha

Casey Cooper is a second generation, 1000 hive beekeeper who prides himself on quality assurance, genetic progression and traceability.

To guarantee his vital service well into the future, Casey realises the need for strict biosecurity measures to safeguard his bee colonies and an accountancy system to track the quality of product.

Whilst honey production is Casey's main focus, he supplements his income from the sale of bees wax, supply of bee hives for fruit and crop pollination services, and the sale of Queen Bees to other apiarists.

Casey has learnt to breed artificially to ensure he has the right bees available into the future. In good years, when there is high nutrition and rainfall, Casey can breed up to six generations and change traits very quickly.

He is highly regarded as an industry leader who is keen to share his skills with others including small bee keepers.

I might add that Casey self-taught himself the skill of artificial inseminating queen bees from a video produced by Sue Cobey a world expert on the subject. Casey will assist Elizabeth Frost from Tocal to deliver an AI course in the near future.

From a NSW Apiarists' Association perspective Casey is a member of the Northern Tablelands' branch and was the president of this branch from 2006 to 2013. He became an executive member of the state council in 2012 and become president in 2013. He also was active as a committee member of the Australian Honey Bee Industry Council during much of this time.

The NSW Farmer of the Year award is open to any farmer, irrelevant of gender or enterprise mix. It is possible to nominate yourself, but Casey was fortunate (although I suspect reluctant) to be nominated by his partner, Sue-Ellen. Once the initial applications are received and sorted, finalists host a visit from the judging panel and undergo an interview process.

As the Minister for Primary Industries, Niall Blair said at the presentation, the awards are both a celebration and recognition of farming excellence through a diverse range of enterprises across NSW.

It was extremely pleasing to see the NSW beekeeping industry represented by one of our capable hard-working individuals, Casey Cooper.

Casey and Sue-Ellen at the Awards ceremony

A NEW RESEARCH PROJECT AT SYDNEY UNIVERSITY AIMS TO PROTECT AUSTRALIAN BEES FROM DEFORMED WING VIRUS

Madeleine Beekman and Ben Oldroyd
Behaviour and Genetics of Social Insects Lab
School of Life and Environmental Sciences
The University of Sydney

As all readers of *Honeybee News* will know, Australia is free of the mite *Varroa destructor*, but it could get here any time. Readers will also know that *Varroa* has caused devastation to the beekeeping industry in New Zealand, North America, the Middle East and Europe, while it is not such a problem in South America and Africa. Why? More and more, scientists are convinced that the problem with *Varroa* is not so much the fact that it bites bee pupae and feeds on their blood, but that it transmits viruses, and in particular deformed wing virus (DWV). New research at the bee lab at Sydney University aims to finally prove whether it is virus or *Varroa* that causes problems. In this way we will help industry to better manage *Varroa* when it gets here.

A virus is a piece of genetic material, surrounded by a protein shell. Viruses can only live inside the cells of another living thing – an animal or a plant, for example. They hijack the genetic machinery of their host and force the host to make more copies of the virus. Eventually the cell becomes a bag of viral particles that breaks open and spreads virus to other host cells.

Viruses have a problem. You've probably been on a train or plane and been exposed to flu virus or common cold viruses. Someone is sneezing and the tiny droplets of fluid that are released contain many, many copies of the virus. Sneezing is the virus's way of spreading itself. It makes its host animal (you!) sneeze so that it can spread to the people sitting close to you. Without you being in close contact with others, the virus would not be able to spread. And herein lies a problem for the virus. The virus really would like to copy itself very quickly inside your body, so that there are more copies of itself that can spread to other hosts. But that would make you so sick you won't be able to get on that plane or train. With you lying in bed (or worse) the virus is stuck inside your body. What the virus needs is for you to be mobile enough to move about and sneeze a lot. That's why most viruses don't kill you, they are just annoying.

DWV has the same problem as every other virus: how does it get out of this bee into another bee? Normally DWV is spread from bee to bee via the bees feeding each other and the brood and via the queen's eggs (DWV is the only honeybee virus that can be transmitted via eggs). So, like the flu and common cold viruses, DWV needs its host to be mobile and to go about its business. This all changes when *Varroa* arrives. When a *Varroa* mite bites a bee larva, it picks up DWV as it feeds on the bee's blood. When it now bites another bee, it spreads DWV to that bee. We say that *Varroa* acts as a vector of DWV. The extraordinary thing about this 'vectoring' is that because *Varroa* provides DWV with a convenient means of spreading, the virus doesn't care if it kills the bee or not. This is a well-understood scientific principle. Viruses spread by vectors tend to be much more deadly than viruses that need their host to be mobile in order to spread. So what scientists think happens is that *Varroa* selects for deadly strains of DWV.

But this is all theory, and we need to test it. About the only place left in the world that has no DWV and no *Varroa* is Australia and so Australia is the only place that this theory can be tested. And no, we are not proposing to introduce *Varroa*!

Viruses are difficult to work with because they can only grow in host cells – in this case bee cells. Researchers at the CSIRO, Departments of Agriculture and the Universities have been conducting research on honey bee viruses for decades. And we all use the same technique of growing the viruses in injected bee pupae in an incubator.

Researchers overseas have looked in detail into the link between *Varroa* and DWV. Their work has shown that there are two main variants, or strains, of DWV: strain A and strain B (there is a third one, strain C, but we don't know anything about C). Strain A always seems to be associated with dying honeybee colonies, while strain B can be present at high levels within colonies without negative effects. Based on the correlation between strain prevalence and colony deaths, we suspect that strain B protects bees from strain A via 'superinfection exclusion'. The argument is that if strain B is present first, it somehow prevents the establishment of strain A. If true, infecting colonies with strain B might provide a means to prevent *Varroa*-DWV-induced colony collapse. In effect we could then 'vaccinate' bees against *Varroa*-mediated DWV. But that requires two things: (1) that *Varroa* in itself is not the main culprit, and (2) that DWV strain B is indeed harmless to bees and protects against DWV strain A.

Disentangling the effect of *Varroa* and DWV is not easy. In all honeybee populations that are infected with *Varroa*, DWV is also present. Yet, the effect that *Varroa* and DWV have on the bees depends strongly on the bee population. While overall the association between colony deaths and strain A versus no colony deaths and strain B seems to hold overseas (and we are currently working on a publication documenting this relationship), this does not prove a protective effect of strain B. Perhaps it is the bees that have been selected to withstand the negative effects of *Varroa*, DWV or both. Or maybe the mites are different, and there is no effect of DWV strain on bee mortality. We don't know, but it is very important to find out.

Because our bees are one of the few bee populations world-wide that are naïve to both *Varroa* and DWV (or any other *Varroa*-associated pathogen for that matter), we can carefully disentangle the role of *Varroa* and DWV on bee mortality. Understanding the exact relationship between *Varroa*, DWV and colony deaths is the main aim of our current research.

<u>Why this is critical research for the Australian beekeeping industry</u>

No doubt most readers know that on July 1 2016, a colony of *Apis cerana* was intercepted in Townsville carrying *Varroa jacobsoni*. While the colony was swiftly destroyed, along with the *Varroa* it carried, its arrival illustrates that our borders are not impervious to incursions. Hence, Australia's *Varroa* and DWV-free status may soon be over.

We had better prepare ourselves.

Wouldn't it therefore be wonderful if we could 'vaccinate' our bees with DWV strain B to protect them from the more dangerous strain A that *Varroa* most likely will bring with it as happened in New Zealand when *Varroa* arrived carrying DWV strain A)? If 'superinfection exclusion' is really the reason why we find bee populations that do not seem to suffer from *Varroa* and DWV, we can prepare our bees (after full industry consultation and agreement of course). The first thing we need to establish before we could even start discussing such a 'vaccination' program is if there is a difference in virulence between DWV strains A and B in Australian bees. Because our bees have never been exposed to DWV they have not been selected for tolerance or resistance to the virus or *Varroa*. What we need to do is test whether our bees are affected by DWV strain A and B. And this is what we propose to do.

Why what we will do is safe

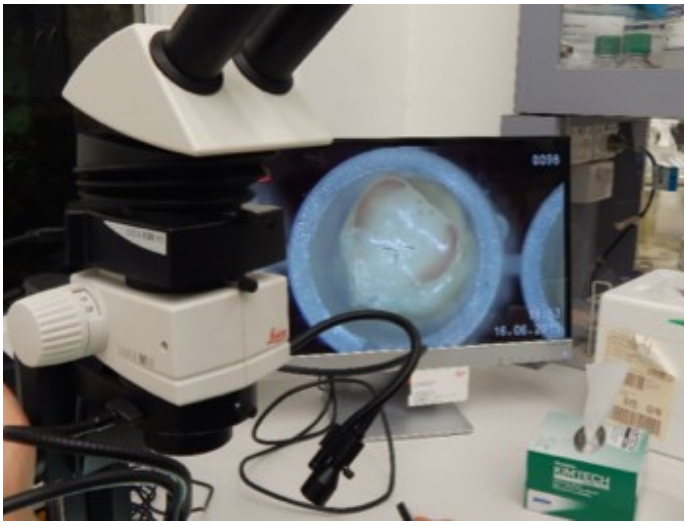
Unlike bacteria, you can't grow a virus on an agar plate. To grow bee viruses we have to inject bee pupae (or maybe a bee cell line – but reliable bee cell lines do not exist) with the virus. We have developed a neat system using white-eyed pupae, as is standard practice for honeybee virus work. We inject the pupae and then place them in plastic plates normally used for molecular biology work. Such plates have 96 'wells' and we place a single pupa in each well. By placing the whole plate then on its side, the pupae are in the same position as they would be when reared in a comb. (There are some pictures below.) It is tricky to determine if a pupa is dead or alive, as they don't move, but we figured out that we can use their change in eye colour. As they develop, their eyes get darker, but not when they are dead. We take daily photographs of the eyes of the pupae so that we know when the eyes stopped changing colour. We keep the pupae in an incubator in a laboratory with swipe card access only. The pupae NEVER leave the lab. When the experiment is over we autoclave everything – pupae, equipment, the lot. All samples are signed in and out so all samples are accounted for.

We are acutely aware of the responsibilities that will come with working on an organism that is not naturally present in Australia. Our lab at the University of Sydney is an approved Biosecurity Premises (Biosecurity Containment Level 1), which means that all our methods have been approved by Biosecurity inspectors and remain under close scrutiny via 6-monthly inspections. All material that enters the lab is dealt with in such a way that contamination is impossible. Only trained personnel have access to the samples.

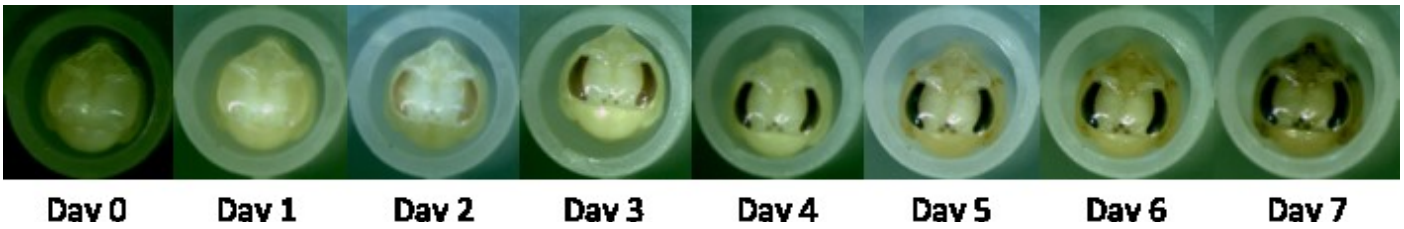
Most of our work is on Australian viruses such as black queen cell virus and sac brood. But in order to determine the effect of DWV on bees in the absence of *Varroa*, we will need to inject bee pupae with DWV. DWV has been sourced from New Zealand under our Department of Agriculture and Water Resources import permit number 0000917783 and all work is performed within our secure laboratory. At no time will infected material come into contact with non-experimental bees or other insects. We do not work with free flying bees and all material is kept in incubators within our Biosecurity lab and is destroyed before adults hatch.

Who is paying for the research?

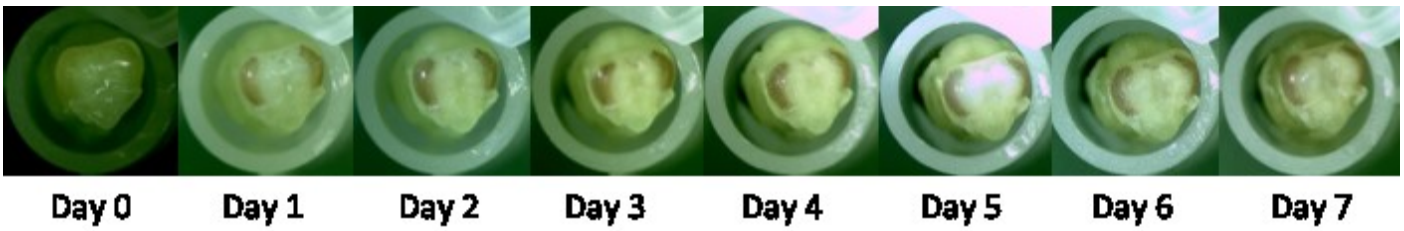
The research is funded by the Australian Research Council and the University of Sydney. No industry or RIRDC funds have been use for this project.



A healthy pupa going through development. Each day its eyes are a little darker than the day before. Photo: Boris Yagound



This pupa wasn't doing so well….It died around day 2. It was injected with a large dose of sacbrood and black queencell virus. Photo: Boris Yagound



We use a microscope with attached camera to photograph our pupae. Here you see the pupa on the computer screen. Photo: Boris Yagound

SYDNEY EASTER SHOW

Volunteers for Honeyland are needed for the 2017 Sydney Show which runs from

6 April - 19 April 2016

If you would like to help you will be very welcome. Entry ticket is provided + free time for exploring the Show is arranged.

Contact: BRUCE WHITE
SHOW COORDINATOR
Phone: 02 9634 6792
Email: brucesown@outlook.com.au

NSWAA 2017 ANNUAL CONFERENCE

The NSW Apiarists' Association Annual Conference will be held on 18 -19 May at the Ballina RSL Club, River Street Ballina.

The Agenda and Speaker Profiles (including overseas guests) will be published in the next edition along with a Registration form.

NSWAA FIELD DAY

In conjunction with the upcoming

NEW SOUTH WALES APIARISTS' ASSOCIATION ANNUAL CONFERENCE

The North Coast Branch will be holding a **FIELD DAY** at the delightful Alstonville Showground

SATURDAY 20 MAY 2017

The Showground is only a few kilometers from Ballina and has plenty of indoor and outdoor space

A good roll up is expected from commercial and part time beekeepers

For further information or site bookings

Contact: Geoff Manning Ph: 02 6663 5211
Email:podargus@ycw.com.au

OR

Col Maloney Ph:02 6663 7051
Email: candsmaloney928@gmail.com

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– an upcoming workshop

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- Good family communication – think before you speak.
- What's your business passion – core business management elements.
- What is your business acumen?
- Leadership, balance and setting a new 'DNA' for your family.
- The great transition – what does your succession look like?

Date: Wednesday 17th May 2017
Time: 9am till 3pm
Where: Ballina RSL

Cost: Subsidised by NSWAA for members and partners. Cost for NSWAA members will be no more than $50 p.p.

For more information or to register contact Pip Job
Email: **pip.job@dpi.nsw.gov.au** or ring **02 6881 8290**

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NSW GOVERNMENT Department of Primary Industries

Rural Resilience Program

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18 & 19 MAY 2017

WHERE

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REGISTRATION INCLUDES
ENTRY INTO TRADE SHOW

NON DELEGATES

ENTRY AVAILABLE ONLY
18TH MAY BETWEEN
2 - 4PM @ $20 P/PERSON
OR
WINE & CHEESE EVENING
5.30PM @ $20 P/PERSON
PRE-PURCHASE REQUIRED

ATTENTION ALL MEMBERS

Re: Honeyland at 2017 Royal Easter Show - 6-19 April

In 2017 the NSW Apiarists' Association will again be participating in the Sydney Royal Easter Show. The *Honeyland* site has been booked in the Woolworths Fresh Food Dome and we anticipate as in previous years to operate the Beezeebo as part of the RAS's agricultural educational program. The Association sees these initiatives as an ideal opportunity to promote our industry, Australian honey as well as educate the public.

Products
We are again hoping to offer a honey promotional bag with the contents being donated packers' honey, recipes cards and educational pamphlets. In past years this promotional bag has been very successful –the donated stock from honey packers is what has contributed to its success.

The Association is now seeking expressions of interest for promotional product to be included in the Promotional Bag for the *Honeyland* site at the 2017 Royal Easter Show. We have been very appreciative of your contribution in the past and would now like to seek your commitment for 2017 and enable us to get this great Australian product out to the Australian public.

The executive would like branches to contribute 250gm and/or 500gm plastic jars of honey of any type without labels. Please do not hesitate to contact the Show Co-ordinator, Bruce White directly on 02 9634 6792 or email blwhite11@hotmail.com.au for the delivery details.

Volunteers
The success of *Honeyland* is also contributed to the commitment of members who voluntarily give their time to help out. Could members please contact Show Co-ordinator Bruce White directly on 02 9634 6792 or email blwhite11@hotmail.com.au to indicate your support. The show starts on 6 April and finishes on 19 April with set up on 4 and 5 and pack up on 20. The cut-off date for volunteers to notify Bruce is 11 March.

Accommodation
As in the past, accommodation will be available to those assisting at *Honeyland* and living outside the city rail network. The accommodation of choice is Ashfield Manor. Members are asked to email Ros info@nswaa.com.au if and when you require accommodation no later than Monday 13 March.

We look forward to hearing from you.

Ros Riggs
Secretary/Treasurer

NSW APIARISTS' ASSOCIATION INC.

NOTICE OF MOTION

The proposed changes to our constitution have been put forward primarily to overcome the difficulties faced at the Annual Conference in recruiting candidates to fill Executive Committee roles.

Your Executive seeks your support for the amendments outlined below.

PROPOSED CONSTITUTIONAL CHANGES FOR 2017 AGM

PROPOSED MOTION 1

'That the proposed amendments to the Association's constitution as advised below be accepted by the members.'

Current	Proposed
7. MANAGEMENT a. The Association shall elect, at its first Annual Conference, a Council consisting of five Members. No Member of the Association shall be eligible for election to the Executive Council unless they reside in NSW or the ACT and has been a Financial Member for at least two successive years immediately prior to the date of the holding of the Annual Conference at which Nominations, for election, are received. Each member shall be elected for a 2 year term and must retire from office at the Annual Conference held at the end of such 2 year term, but if eligible, may seek reappointment. At each Annual Conference the number of members of the Executive Council that must retire will be as follows: i. at the Annual Conference held in 2013, two members must retire; ii. at the Annual Conference held in 2014, three members must retire This two year pattern will repeat thereafter. The members who must retire are those who have held office the longest since last being elected or appointed. If 2 or more members have been in office for the same period, those members may agree which of	7. MANAGEMENT a. The Association shall elect, at its first Annual Conference, a Council consisting of five Members. No Member of the Association shall be eligible for election to the Executive Council unless they reside in NSW or the ACT and has been a Financial Member for at least two successive years immediately prior to the date of the holding of the Annual Conference at which Nominations, for election, are received. Nominations for Executive Council Nominations to be submitted to the Secretary no later than 21 days prior to Annual Conference, and they must include the following: i. Name and signature of nominee ii. Names and signatures of nominator and seconder (both must be financial members of the Association) iii. Information outlining the nominee's industry background – with the exception of retiring councillors who have served their current term and are seeking re-election Nominations for vacancies will be accepted from the floor at Annual Conference.

them will retire. If they do not agree, they must draw lots to decide which of them must retire.

b. The Executive Council elected by Conference shall itself elect its President and Vice-President and the full Council shall then consist of the following:

1. President
2. Vice-President
3. Three (3) Councillors

Subject to this Constitution, the management and control of the Association shall be vested in the Executive Council who may make regulations to govern any matters not directly dealt with in these Rules. No member of the Executive Council shall serve more than 5 consecutive years as the President.

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THE FROST REPORT

Elizabeth Frost
Education Officer, Honey Bees
Tocal Agricultural College, NSW Dept. of Primary Industries
T: 02 4939 8821 M: 0437 731 273 E: elizabeth.frost@dpi.nsw.gov.au

ACCREDITED COURSES IN 2017 & NORTH AMERICAN BEEKEEPING CONFERENCE

USING BEES FOR POLLINATION COURSE

DESCRIPTION: This course suits beekeeping and horticulture industry professionals that provide bees for pollination, require bees to pollinate their crop, or broker and audit bee hives.

Palletised colonies placed in an almond orchard for contract pollination, August 2016

- 7 March (8:30am-5pm) Yanco Ag Institute
- 14 March (8:30am-5pm) Tocal College
- 28 March (8:30am-5pm) Grafton Primary Industries Institute

TRAINERS: Doug Somerville (Technical Specialist, Honey Bees), Elizabeth Frost (Education Officer, Honey Bees)

COST: $475 per person (morning tea, lunch and afternoon tea provided).

COURSE AIMS: Understand the process of pollination, management and assessment of hives for pollination, how to price and formalise a pollination contract, how to maximise pollination by planning your farm with bees in mind, individual crop pollination requirements, risks to pollination efficiency and pollinators in the crop (Example: pesticide, fungicide, water quality/availability, hive positioning).

LEARNING OUTCOMES:

- Assess pollination service requirement
- Price and formalise agreement for pollination services
- Monitor pollination performance of bee colonies
- Comply with industry and legislative requirement

COURSE PROGRAM/STRUCTURE:

- What is pollination? Flower structures and pollination scenarios
- What are pollinators? The birds, bees, bats and other insects
- Bee biology for pollination
- Commercial pollination logistics
- Pollination standards: hive grading
- Individual crop requirements
- Orchard design to maximise pollination
- Hive management in the crop
- Hive assessment & auditing
- Post-pollination hive management
- Contracts between beekeeper and grower
- Pesticides and pollinator impact
- Protected cropping pollination
- Honey bee biosecurity
- Native bees and novel honey bee uses

Doug Somerville (in hi-vis vest) demonstrating hive assessment techniques to Select Harvest employees, August 2016

RESOURCES AND METHOD OF DELIVERY: Each participant receives the Pollination Course Notebook, in future to be published as AgGuide: Pollination. This course is delivered using both indoor and outdoor instruction. Instructors will provide the loan of personal protective equipment (for example: gloves, bee veils, full bee suit, jacket and veil) as needed.

ACCREDITATION: This course has been mapped to the national unit of competency, AHCBEK404A - Provide bee pollination services. This is an Elective Unit of Competency within the Certificate III in Beekeeping (AHC32010).

Macarthur ABA member demonstrating the larval smear sampling technique during a Pest & Disease Course

BEGINNING IN BEES COURSES

DESCRIPTION: A practical beekeeping course for new beekeepers.

- 7-8 March (8:30am-4pm) Tocal College
- 30-31 May (8:30am-4pm) Tocal College
- 29-30 August (8:30am-4pm) Tocal College
- 10-11 October (8:30am-4pm) Tocal College

TRAINERS: Variable: Danielle Lloyd-Prichard, Nathan Friis, Mark Page and/or Miskell Hampton

COST: From $390 depending on location, GST free (morning tea, lunch and afternoon tea provided).

COURSE AIMS: To provide practical experience in manipulating a bee hive and carrying out general management practices including hive inspection and sampling for pests and diseases. To provide an understanding of the physiology of a bee colony.

LEARNING OUTCOMES:

- Identify bee life cycles
- Understand the mechanisms of a bee colony
- Understand the terminology used in the beekeeping industry
- Identify beehive component parts
- Manage bee colonies for survival and productivity
- Inspect and manipulate a bee hive

COURSE PROGRAM/STRUCTURE:
DAY 1:

- Protective clothing and occupational health and safety
- Opening a hive, hive components and assembly
- Bee biology and seasonal management
- Honey flora
- Legislation
- Diseases and pests of bees

DAY 2:

- Extracting and storing honey
- Inspecting hive for disease
- Honey marketing, food safety and record keeping
- Purchasing hives
- Other products from the hive
- Industry structure
- Evaluation and close

Resources and method of delivery: Participants will receive a copy of the publication Bee Agskills and additional course notes. This course is delivered using indoor and outdoor instruction.

Accreditation: This course is mapped to the national units of competency:
AHCBEK202A - Use a bee smoker
AHCBEK203A - Open and reassemble a beehive

Mobile extraction facility built to Canadian food safety standards on display at the NABC Tradeshow

NORTH AMERICAN BEEKEEPING CONFERENCE

This January I was humbled to speak at the North American Beekeeping Conference (NABC) in Galveston, Texas on the subject of "Australian Nationally Accredited Beekeeper Training." The event organisers covered my registration fees and I personally paid for the rest, that is, transportation and lodging. Like the Australian National Conference, the NABC brought peak industry bodies together which usually hold separate conferences. This joint conference brought together the American Beekeeping Federation, American Honey Producers Association, and Canadian Honey Council, all peak industry bodies within North America. The American Bee Research Conference was also held at the same venue. Conference attendees were spoiled for choice between concurrent sessions geared toward recreational, sideliner scale and commercial, 10 minute research summaries at the American Bee Research Conference and a seriously diverse tradeshow (note the Canadian mobile extraction facility pictured above).

In my opinion, the talk of greatest significance was on neonicotinoids' attractiveness to honey bees and bumble bees and what affect the pesticides have on the insects' motor function, that is, how they move after collecting nectar containing field-relevant levels of neonicotinoid pesticide. "Impact of Neonicotinoid Pesticides on the Behavior, Learning, and Memory of Bees" was the title of the presentation by Dr. Geraldine Wright of Newcastle University, Newcastle upon Tyne, United Kingdom. Dr. Wright's talk was based on her lab's work published in the following two journal articles:

1. "Bees prefer foods containing neonicotinoid pesticides" www.nature.com/nature/journal/v521/n7550/abs/nature14414.html

2. "Exposure to neonicotinoids influences the motor function of adult worker honeybees" www.ncbi.nlm.nih.gov/pmc/articles/PMC4165879/

The first study states, "the impact of neonicotinoid insecticides on insect pollinators is highly controversial. Sublethal concentrations alter the behaviour of social bees and reduce survival of entire colonies1, 2, 3. However, critics argue that the reported negative effects only arise from neonicotinoid concentrations that are greater than those found in the nectar and pollen of pesticide-treated plants4. Furthermore, it has been suggested that bees could choose to forage on other available flowers and hence avoid or dilute exposure4, 5. Here, using a two-choice feeding assay, we show that the honeybee, *Apis mellifera*, and the buff-tailed bumblebee, *Bombus terrestris*, do not avoid nectar-relevant concentrations of three of the most commonly used neonicotinoids, imidacloprid (IMD), thiamethoxam (TMX), and clothianidin (CLO), in food. Moreover, bees of both species prefer to eat more of sucrose solutions laced with IMD or TMX than sucrose alone. Stimulation with IMD, TMX and CLO neither elicited spiking responses from gustatory neurons in the bees' mouthparts, nor inhibited the responses of sucrose-sensitive neurons**. Our data indicate that bees cannot taste neonicotinoids and are not repelled by them.** Instead, bees preferred solutions containing IMD or TMX, even though the consumption of these pesticides caused them to eat less food overall. **This work shows that bees cannot control their exposure to neonicotinoids in food and implies that treating flowering crops with imidacloprid and thiamethoxam presents a sizeable hazard to foraging bees.**"

In the second study, the data shows that "field realistic concentrations […] of 2–3 ppb (parts per billion) doses of neonicotinoids are sublethal to honeybees and are readily consumed by forager honeybees. Twenty-four hour exposure to a sublethal dose has subtle effects on motor function behaviour that are not readily seen by simple observations. The most common response to neonicotinoid exposure was more time spent grooming and an impairment of the righting reflex that lead to more time spent upside down. The overall effect on behaviour depended on the type of neonicotinoid that the bees were exposed to and the dose." Honeybees used in this second study received prolonged exposure to sublethal doses of four neonicotinoid pesticides (imidacloprid, thiamethoxam, clothianidin, and dinotefuran) and the plant toxin, nicotine.

Dr. Wright and her collaborating researchers state "In conclusion, the data we present here adds to the body of work suggesting that field-realistic concentrations of neonicotinoids have subtle behavioural effects on honeybees, which could impair ecologically relevant behaviours such as foraging during a short term exposure of 24 hours, and ultimately reduce colony fitness. Based on unpublished data from our laboratory, we expect that our results for bees exposed to neonicotinoids for 24 hours reflects how they behave when exposed for several days. The difference in our studies with field-relevant exposure of forager honeybees is that our bees were not in flight. It is possible that flight would require that bees consume more solution, and hence receive a bigger dose of the pesticide—perhaps resulting in stronger effects on motor function. Such subtle behavioural effects should be taken into account when pesticides are tested for ecotoxicity. Tests, like the behavioural observations we report here, would be a rapid means of assessing the impact of longer-term exposure to pesticides on bee motor function and could be used as a reliable bioassay for sublethal effects on pollinators."

Additional research and data showing pesticides' sub-lethal effects on pollinators as well as beekeeper's vigilance in reporting pesticide kills (**in NSW report to the EPA at Phone 131 555**) and sampling affected hives must continue if existing and new pesticides are to be held to a higher standard in terms of labeling and application in a way that truly accounts for the sublethal risk to adult bees and subsequently overall colony health.

SYDNEY BRANCH NEWS

The Sydney Branch is developing and sponsoring other courses:

- Flow Workshop - 25 March or 11, 12 or 18, 19 March (will advise firm date)
- Eucalyptus Identification Workshop - June or July 2017
- Honey - Health - Promotion - A one day seminar to increase the awareness of bee-keepers in promoting honey to the public - June or July 2017

As background to the Sydney Branch running "beginning in bees courses" the branch have found it is hard to achieve adequate student numbers with the competition from other Sydney based courses amateurs and commercial.

Also we perceive a need to educate some of the new NSW bee-keepers who themselves or the family bought some of the 2,500 Flow hives. These bee-keepers are not in the "system" and probably not wanting to involve themselves with clubs or branches.

To make this workshop directed to Flow owners we have to advertise and slant in this direction.

The course we run spends 80% teaching bee-keeping without mentioning Flow and hopefully giving them an insight into the industry and associations.

Paul Drew

0403 175 708

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Great product - great customer service - couldn't ask for anything more. Just don't receive this level of service in today's world, so when it comes along it is appreciated.

I will not hesitate to become a return customer of Nuplas.

Thanks guys.

Regards, Jason Stevenson

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RESEARCH TO CUT SUMMER FUN SHORT FOR MAJOR BEEHIVE PEST

The Honey Bee and Pollination RD&E Program
23 January 2017

Beekeepers are being urged to remain on the lookout for Small Hive Beetle (SHB) this summer, ahead of research field trials attempting to trap the pest and reduce its spread.

Small Hive Beetle (SHB) is particularly active during warm and humid conditions, feeding on bee larvae and turning honey into fermented slime.

A Queensland-based research team, led by Dr Diana Leemon and Dr Andrew Hayes is currently developing a synthetic lure to deploy in a trap to capture the beetle, as part of a project funded by the Honey Bee and Pollination Program.

"To date, lab studies have identified compounds present in natural substances that are highly attractive to SHB," Dr Leemon said.

"These compounds have been blended together into a lure to attract beetles towards a trap instead of a beehive, and field testing of the lure has started this month in various locations near active bee hives around Queensland."

"Trapping of SHB with a natural attractant is currently being carried out to gather information on the movement and behaviour of SHB, and this information will help determine the best time and place to deploy traps with the synthetic lure."

Chairman of the Honey Bee and Pollination Program, Michael Hornitzky, said the research was crucial in managing SHB incursions.

"It is exciting research in terms of developing the odour lure and modifying a non-specific commercial trap to contain the lure," Dr Hornitzky said.

"It is hoped that this research could help the beekeeping industry establish more extensive eradication strategies for the future."

Results from the field trials are due to be released mid-2017.

SHB is now established throughout coastal regions of Australia, from Cape York in Queensland, to Adelaide and northern parts of Western Australia.

Incursions can badly disturb honey production, and in some cases result in the complete loss of hives.

Beekeepers in affected areas are encouraged to closely monitor any signs of changes to their hives, and contact their respective state or territory agricultural department for advice if the beetle is detected.

Media contact: Megan Woodward on 0487 352 859

The Honey Bee and Pollination RD&E Program is a jointly funded partnership with the Rural Industries Research and Development Corporation (RIRDC), Horticulture Innovation Australia Limited (Hort Innovation) and the Australian Government Department of Agriculture and Water Resources. RIRDC funds are provided by honey industry levies matched by funds provided by the Australian Government. Hort Innovation funding is from the apple and pear, almond, avocado, cherry, dried prunes, summer fruit and onion levies and voluntary contributions from the melon and canned fruit industries. Levies are matched by funds from the Australian Government.

NUISANCE BEE COMPLAINT REPORTS AND ADVICE OF ABANDONED AND/OR NEGLECTED APIARIES

Nuisance bee complaints and Advice of abandoned or neglected hives are to be reported direct to NSW/ACT Domestic Quarantine Help line:

Phone: 1800 084 881
Mail: PO Box 6682, Silverwater NSW 1811
Email: quarantine@dpi.nsw.gov.au

These forms and other compliance forms can be located at: http://www.dpi.nsw.gov.au/animals-and-livestock/bees/forms

Both forms were amended to include both the postal and email addresses. Click on the links below:

Report of honeybees creating a nuisance
Advice of abandoned, neglected and/or diseased apiary

You can contact me direct if you would like to discuss issues involving nuisance bees, neglected hives or other bee related compliance issues.

Mick Rankmore
Regulatory Specialist, Apiaries
Biosecurity Compliance
Department of Primary Industries
PO Box 546 Gunnedah NSW 2380
T: 02 6741 8374 M: 0402 078 963
E: michael.rankmore@dpi.nsw.gov.au

Report of honeybees creating a nuisance

This form may be used by members of the public to report bees that are creating a public nuisance or are a risk to public health and safety. This form should be read in conjunction with the Fact sheet Nuisance bee complaint guidelines. Please complete the form and submit it to the address shown at the bottom of this form.

Office use only: Reference number	

Please print clearly.

Name of complainant	First name:	Last name:
Residential address:		
Locality:		Post code:
Contact telephone numbers: (H): (B): Mobile:		
Email address:		

Owner of the bees:	First name:	Last name:
Address of bees:		

Why do you consider the bees are creating a nuisance?

How long have the bees been a nuisance?

What attempts have you made to resolve the problem?

Please draw a plan or provide a map showing the location of the nuisance bees, the location of yours and the beekeeper's buildings and any other relevant structures.

Signature: . ..... Date: .....

Privacy note: This information will be used by NSW Department of Primary Industries to investigate your complaint. It will be treated confidentially and not disclosed to persons outside NSW Department of Primary Industries except as required by law.

Submitting this form

➔ **Mail: PO Box 6682, Silverwater NSW 1811**

➔ **Email: quarantine@dpi.nsw.gov.au**

NSW GOVERNMENT | Department of Primary Industries

Advice of abandoned, neglected and/or diseased apiary

This form may be used by beekeepers or members of the public to report suspected abandoned, neglected or diseased hives to the authorities for investigation. If left, such hives can be a source of serious honey bee diseases or pests.

Please complete the form and submit it to the address shown at the bottom of this form. You will be provided with a report of the findings within 18 weeks.

Please print clearly. Attach additional information if there is not enough space on this form.

First name ..... **Last name**.....

Address .....

.....

Telephone: Home.....**Business** ..... **Mobile**.....

Exact location of the apiary (if required attach a map of the location to this form).

....

.....

.....

Provide GPS co-ordinates (if known) **S**..... **E** ..... **Format**.....

Date you last saw hives at this location: .....

Estimated number of hives and description: .....

List registration numbers on boxes (if known).....

Owner of the land and contact name and number (if known): .....

.....

Are there any known apiaries within 3km of this apiary: ☐ Yes ☐ No ☐ Unknown

If yes, approximate location and distance from this apiary: .....

Why do you consider this apiary is neglected / abandoned / diseased? .....

....

.....

Are you willing and able to show an inspector the site at a mutually convenient time? ☐ Yes ☐ No

Signature: .....Date: .....

Privacy notice: This information will be used by the NSW Department of Primary Industries (NSW DPI) to investigate your advice. It will be treated confidentially and not disclosed to persons outside NSW DPI except as required by law.

Submitting this form

Mail: PO Box 6682, Silverwater NSW 1811 Email: quarantine@dpi.nsw.gov.au

Office use only: Reference number

TRIM ref: INT12/41974 Form version: 5 September 2012

www.dpi.nsw.gov.au

Whats Happening to the Bees? - Part 6

MITOTYPES, GENOTYPES AND TRADEOFFS IN FITNESS

by Randy Oliver - ScientificBeekeeping.com

First published in: American Bee Journal, September 2014

In my last article, I showed how greatly the genetics of wild-living honey bee populations differed from those of managed populations. So let's take a look at the processes that have led to that differentiation, and the consequences. But first, I should review some concepts involved in the selective breeding of bees.

In business or sports, success is all about being "better" than the competition. And so it is in nature, with each honey bee colony vigorously competing against the competition (other colonies) for resources, including nest cavities. And by supplying ideal nest cavities, early beekeepers gave "kept bees" a leg up on the competition. But there is no such thing as a free lunch—in nature, any advantage typically comes at a cost. Evolution is generally a zero sum game; by becoming better at any one thing (emphasizing one trait), a species must give something up in return (losing the ability to do something else as well).

What Is "Fitness"?
Nature mindlessly selects for the most fit of each species by the process of continually weeding out the less fit. But just what do we mean by "fit"? Here's the key thing to keep in mind:

Nature does not favor specific traits nor reward success. Nature only penalizes failure. Those left after penalization are called survivors, or "more fit."

Any species, race, or breed of any plant or animal is alive today only because it was more fit than the competition in the never ending (and ever changing) process of natural selection.

However, Nature's definition of "fitness" may not necessarily be the same as that of man's. When a species enters into a symbiotic relationship with mankind, man can change the definition of "fitness."

"Fitness" is a relative concept which is completely dependent upon the selective pressures exerted upon the species by its local environment. Man has the ability to drastically change those selective pressures.

For a number of wild animal species that live in proximity of human habitation, the results of man's recent selective pressure has been that the definition of "fitness" now includes a strong fear and avoidance of being within gunshot range. On the other hand, several of species of plants and animals have profited from a symbiotic relationship with humans, as humans facilitate the realized niche of those with desired traits. For some of these, this symbiosis has been wildly successful.

For example, a single species of plant, *Zea mays* (a formerly obscure species of Mexican grass), with considerable human facilitation, now outcompetes all other vegetation on some 625,000 square miles of the Earth's surface (an area nearly equal to the entire land surface of the 12 states of the American Midwest). Maize could certainly now be considered to be a highly successful species. Yet if humans were to abruptly withhold their support, maize would go extinct within a few years, unable to survive without human facilitation of its niche (the ancestral grass, teosinte, would continue to survive [1]).

How could the clear success of such a species have come to the point that it hangs from the thread of human husbandry? C'mon, how long do you think Pomeranian dogs, Holstein cattle, or Cornish Cross broiler chickens would survive as breeds in the wild? When we breed for certain traits favored by humans (selective breeding), the zero sum game extracts a cost–a species loses in turn fitness traits for hardiness and adaptability to the challenges of life in the wild.

In the case of maize, we've bred out a critical allelochemical [2] that the ancestral stocks produced to deter insect pests, made the plants more dependent upon water and fertilization, and bred for seed heads that are now digestible by ruminants and not conducive to self-propagation. And of even greater concern, we've bred out natural genetic variability in the domesticated stocks, which greatly hampers their ability to adapt to changing environmental pressures [3].

And what's This Got to Do with Bees?
In my previous article in this series, the pie charts of survivor matrilines of honey bees in feral colonies clearly showed that those lines of bees that we select for in managed populations are not necessarily the lines that demonstrate fitness in the wild. With the added parasite pressures of the varroa/virus complex and *Nosema ceranae* in the last couple of decades, few managed stocks survive for more than a couple of years without human intervention. Yet genetic analysis shows that some unbroken bloodlines of feral bees have been able to persist in the wild for a great many years.

Practical application: I, for one, would like to understand how those feral stocks have managed to survive, and whether we can apply that knowledge, and use those genetics, to breed healthier and hardier managed bees (I'm sick of expensive mite treatments and supplemental feeding). But before you start shelling out cash for specific bloodlines of bees, there is something you should understand about genetic testing.

Mitotype vs Genotype
Let me state that I am no geneticist and the arcane terminology of the field gives me a headache. But there's something that I'd like to make clear about the pie charts of mitochondrial DNA (mitotype) inheritance that I included in the last article. Mitotypes are useful for tracking matrilines, since they can only be passed from mother to daughter. But it is *nuclear* DNA (*genotype*) that codes for the form, color, behavior, and disease resistance of bees. The two types of DNA are largely independent [4], meaning that although mitotype is useful for tracking pedigree, it is mostly genotype that is involved in selective breeding for observable characteristics.

Let me give you an example. Dogs were bred from wolves, and differ in less than 1% of their genes. Each dog breed started from a very small founder population, which led

to each breed being considerably inbred. Despite that fact, several dog breeds contain multiple mitotypes. My point is that we breed for observable (phenotypic) traits (coded for by genotype), not necessarily by matriline (determined by mitotype)—**when you cross two matrilines, one *mitotype* is lost *forever*, whereas roughly half of each *genotype* is carried on in the cross.** In both nature and in breeding, there may be some degree of *introgression* of both nuclear and mitochondrial genes back and forth from one population into another (Fig 1).

It gets even more complicated. Some genotypes appear to work only with some mitotypes (as an analogy, Chevy parts may not work well in a Ford). For example, the M lines (Western European dark bees) are fairly closely related to the A lines (African). Anyone who remembers the hot "German black" bees that used to be common as ferals can appreciate the similarities in their behaviors (although British beekeepers breed gentle M line stocks). The A and M lines can more readily swap nuclear alleles than either can with the C (Italian/Carniolan type) lines [5].

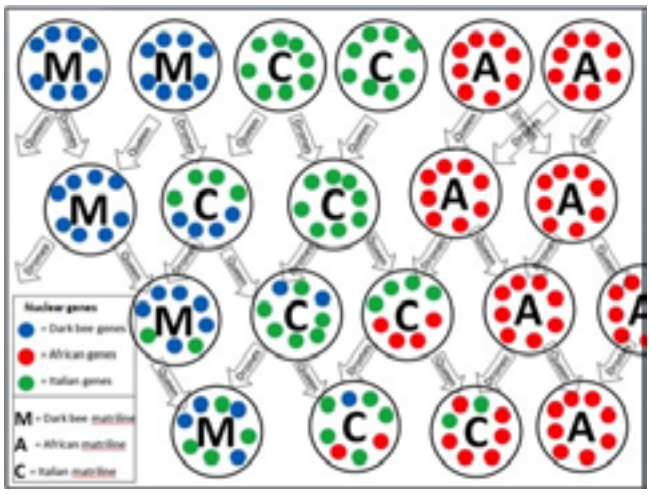


Figure 1. Beekeepers seem to prefer pictures with bright colors as opposed to textual explanations. So I created a hypothetical diagram of the introgression of nuclear genes [6] into different matrilines of open-mated purebred queens of three different races over three generations. Each large circle represents a "composite queen" of all mating possibilities [7], with her mitotype indicated by letter, and nuclear genotype by colored dots. Note how mitotypes can only be passed mother to daughter (upper 4 dots); whereas nuclear genes can also be transmitted by drones (lower dots). In the end, a queen's mitotype and genotype may be considerably different.

In the above graphic, the purebred founders had nuclear genes attuned to their particular mitotype (all Ford parts in a Ford), and would likely have exhibited fitness. Hybrid [8] crosses are often less fit, since some mitotype/genotype combinations don't work well (Chevy parts in a Ford), so not all of these hypothetical hybrids would have actually survived. But occasionally hybrids do gain in fitness—the Africanized bees of the Americas, although predominately of A line *scutellata* mitotypes, have incorporated a substantial proportion of European nuclear genetics [9].

Practical application: you can't tell the genetic mixture of matriline and genotype by simply looking at a bee [10, 11], or by her maternal heritage. In the graphic above, for example, the workers of the C mitotype queen to the lower right would almost certainly be highly defensive, due to the predominance of the African-type nuclear genes that code for behavioral traits.

Nature Doesn't Care About Pedigree

Nature only selects against the less fit, and doesn't give a darn about one's pedigree. In natural selection, whatever works, works. Yet, many breeders focus upon maintaining unbroken matrilines (a number of European bee breeders maintain meticulous records of the pedigrees of their bees [12]). But as pointed out by Keoniger [13], [*M*]*ales contribute to the fitness of their offspring as much as females do.*

Practical question: what are the respective relative impacts of the genetics carried by either drones or queens in nature or in breeding programs? Specifically, to what extent does a breeding program benefit from the contribution of the drone mother colonies or from matings with feral drones?

This may be a technical subject to the casual beekeeper, but has important practical application as we try to breed for bee stocks with better survival characteristics, especially with so many now attempting to propagate "survivor stocks." I've read quite a number of studies on bee genetics, and am trying to sort out the relative contributions of mitotype and genotype to breeding programs [14].

In bees, there are no true "fathers" or "patrilines," since the genetics of any drone come solely from its mother, and then every sperm produced by that drone is a genetic clone of the drone itself. And since sperm rarely contribute mitochondria to a fertilized egg, genetic mitotyping tracks only unbroken mother lines.

On the other hand, each female bee receives equal amounts of *nuclear* genetics (allelic forms of any gene) from both its parental drone and queen. And although the mitochondrial genetics of a *colony* are determined solely by the queen, the phenotype and fitness of that colony is affected by the nuclear genetics of the 10–40 patrilines of workers in the colony (each carrying in common half their nuclear genes from the queen, and half from their respective sires) (Confused? Perhaps Fig. 2 will help).

Figure 2. In this extreme (and even more colorful) scenario, every drone carries a different allele for each of the four genes illustrated (color coded by drone) [15]. Note how an open-mated breeder queen from a purebred (all green) line may produce a winning combination of genetically diverse workers. But when you graft a queen from that perfect colony and mate her out in a different yard, the resulting colony, although of the same queen line, may be substantially different genetically.

Practical application: it's difficult to propagate open-mated purebred lines of bees in a mongrel population such as we have in the U.S. (not that that is necessarily a bad thing). In the example above, the beekeeper grafted a daughter from a "dream colony," the stellar performance of which was due to the perfect team of sister groups of workers (patrilines sired by different drones). But that daughter *queen* only carried half the alleles of the parent colony as a whole, and the daughter *colony* only a quarter

of the (green) alleles of the original queen mother. This is a common frustration in bee breeding.

It's abundantly clear that the nuclear genetics of drones may contribute substantially to the performance of their offspring, as evidenced by the often strong (positive or negative) effect of hybridization between a queen of one stock and a drone from another. Yet the distribution of matrilines in my aforementioned pie charts strongly suggests that some matrilines survive better in the wild than do others. I do not know why matriline appears to be so important.

Practical question: What can we learn from practical experience and studies to date? The data are conflicting. Of interest is the famously successful invasion of the hybrid Africanized bees into the Americas, which have largely or completely displaced pre-existing European stocks. Although the leading edge of the invasion appeared to be dominated by African matrilines [16], there was also mixing and phenotypic expression of nuclear genes [17] due to drones of each race mating with queens of the other. Notably, a substantial contribution (20-30%) of European *nuclear* genes remains in the Africanized population [18, 19]. In the long run, although a mixture of various African matrilines eventually dominate in the population, some European matrilines persist (with the M lineage being much more successful in the tropics than the C (Italian/Carniolan) lineage) [20].

Practical answer: Our current state of knowledge does not allow me to definitively rank the relative importance of matrilines and drone contributions to successive generations. Each appears to play an important part in natural selection, with certain matrilines predominating under certain environmental circumstances.

Practical note: Pinto [21] points out that the strong selective pressure by varroa may have been a critical contributing factor in the introgression of the African genome into the Texas bee population, since the mite effectively wiped out the European feral competition, opening up an unexploited niche to the "Africans." The point is that no matter how "fit" a certain breed may be at the moment, the introduction of a single parasite or other novel environmental factor may immediately make previously successful genetic combinations obsolete. Another thought: keep in mind that in Mediterranean and temperate Europe, the C and M lines held their own against the African matrilines (from which they originally descended). It could well be that in the US, once the European stocks evolve resistance to varroa, that they may reclaim territory currently held by the Africanized bees.

We still have a great deal to learn about breeding honey bees for optimum performance and survival. I plan to return to this subject later on in this series when I discuss the future of bee breeding.

The Grass Is Always Greener
Speaking of breeding, it seems to be human nature to tend to think that bees from somewhere else would be better than the local stock. In actuality, it depends upon what one means by "better." For early beekeepers, "better" likely meant less stinging, and perhaps a propensity to store a greater amount of honey. Some 3000 years ago commercial beekeepers in Israel imported a more gentle and productive race of bee from Turkey [22]. For similar reasons, beekeepers in this country came to prefer gentle Italian, Carniolan, and Caucasian stocks (all C lineages) over the originally imported (and successfully invasive) "German dark" bees (M line).

And for commercial migratory beekeepers today, Italian- or Carniolan-type stocks are justifiably preferred, just as White Leghorn chickens or Angus cattle are preferred by their respective producers.

Practical application: migratory beekeepers need high-performance bees *specifically adapted to the commercial niche*, which includes early buildup, intense crowding, rough handling, heavy supplemental feeding, regular treatments for parasites, and exposure to ag chemicals and miticide residues. The U.S. queen market predominately caters to these beekeepers, thus, breeders select for appropriate traits. Nothing in this article should be taken as a criticism of commercial stocks.

Locally-Adapted Stock
But as we could see from the pie charts in my previous article, Nature may exert a far different selective pressure than do commercial bee breeders. Nature selects for bees that survive without human help *in their specific environment*. Such bees are termed "locally adapted."

Note that the concept of geographic "local adaptation" is difficult to apply to migratory bees that may be moved from Texas to California to Washington to North Dakota all in one season. But how about stocks for stationary beekeepers who wish to maximize their profits by minimizing the costs of feeding and treatments? Could they benefit from keeping bee stocks that are better adapted to local conditions [23] (see Fig. 3, in which I continue to outdo myself with colorful graphics)?

Figure 3. In which ecoregion do you keep bees? There is absolutely no reason to expect that bees selected for fitness in any one of the differently-colored ecoregions above would perform well in another region. Source: TH Ricketts [24].
As Büchler [25] points out:
In the majority of selection and breeding programs, economic traits (such as honey productivity and colony strength) together with traits desirable for modern beekeeping (such as gentle temper and low swarming tendency) have been of predominant importance. In contrast, disease resistance, viability, and adaptation to local conditions were considered less important, as deficiencies in these characters could often be compensated by pharmaceuticals, artificial feeding, and other management techniques.

Practical question: the honey bee as a species exhibits extreme plasticity (as evidenced by the numerous indigenous races), and can be bred for nearly any combinations of traits. The question to me, in this day of 30% winter losses despite the time and money invested in feeding, medicating, and mite treatments, is whether we've been breeding for the right traits?

When we breed stock for the benefit of high production, it typically comes at a cost in overall fitness. As Charles Darwin observed in 1857, "*...as Goethe expressed it, 'in order to spend on one side, nature is forced to economise on the other side.'"* Evolutionary ecologists term this relationship "*tradeoffs in fitness components."* With the level of colony mortality that many beekeepers are experiencing with today's bee breeds, we may wish to reevaluate the cost/benefit ratio of the traits that we select for (Fig. 4).

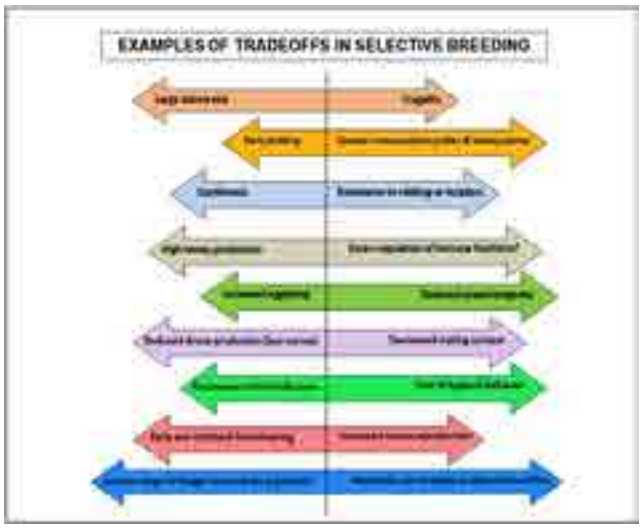


Figure 4. There are always tradeoffs in the breeding of bees. When you select your breeding stock, you must think about the direction you wish to move each arrow—every trait that you select for comes at a cost.

To a biologist, it just seems like common sense that a bee stock adapted to the local environment would be expected to survive better with minimal management than would an exotic breed. Think about it—the process of natural selection would have already done most of the work for us. Bayer [26], speaking of livestock in general, explains:

Generations of natural and deliberate selection have resulted in local breeds with a high degree of disease resistance or tolerance and capable of subsisting on the available feed resources, which are seasonally scarce and of low quality.

The breeders of other species of livestock are showing great interest in the breeding potential of locally-adapted breeds, especially for parasite resistance and ability to survive in inhospitable areas [27]. As for honey bees, a recent issue of the Journal of Apicultural Research is devoted to this very subject [28]. Let's see what the researchers found:
Francis [29] concluded that:

Our results suggest that bees of local origin are better in tune with environmental factors related to flowering patterns, climatic variation and locally prevailing apicultural methods and therefore may command more sufficient resources to fend off pathogens.

Hatjina [30] found that:
The local genotypes showed a trend to collect more honey than the non-local ones, which shows their ability to develop higher adult bee populations…and better ability to forage on the local flora. This adaptation and their longer survivorship…could also explain the fact that the survived colonies (most of them of local genotypes) had higher honey production during the second year.

Costa [31] in Italy found that locally-adapted Italian stocks produced more honey than Italian stocks imported from other parts of the country. Dražić [32], testing Carniolan stocks in Central Europe found that:

At the end of test period, colonies of introduced genotype had lower survival rates at both locations.

Buchler [33] explains:
Ecological studies have shown that genotype × environment interaction is an indicator for local adaptation and fitness. The most important form of this interaction is antagonistic pleiotropy [34]*, whereby different alleles have opposite effects on fitness in different habitats. This implies that no single genotype is superior in all environments, leading to a trade-off in adaptation to different habitats…*

Most of the theory relevant for local adaptation concentrates on the evolution of ecological specialization, assuming a trade-off in fitness across habitats mediated by a quantitative trait or traits… In simple words, local adaptation should result in improved fitness of each population in its own habitat…

In our study, we observed a significantly higher survivorship of the local genotypes compared to the non-local ones, clearly indicating a specific local adaptation of the honey bee populations considered in the experiment.

Furthermore, the results of our study show that it is not merely an ecological issue, but also a commercial one: the use of local honey bee populations provides a higher chance of colony survival, and the use of maladapted bees attributes to high colony losses, as recently observed in many regions. *Thus, local breeding activities should be promoted and encouraged throughout the native range of Apis mellifera.*

Wrap-Up
What with all the health issues that we're having with bees these days, we may want to take a closer look at "survivor stocks" that manage to stay alive without human assistance. I suspect that our feral stocks are an invaluable and underutilized resource. The challenge will be to use them as base stocks from which to select those that are workable and productive, without losing their toughness [35]. The first step will be to start propagating stocks naturally adapted to each of the colored ecoregions in Figure 3.

Practical application: what are you waiting for? It is unreasonable to expect the large queen producers in the West and South to breed for bees specifically adapted to your area. I have asked for shows of hands from audiences all over the continent, and can assure you that there is a strong demand for locally-adapted mite-resistant stock. Entrepreneurial beekeepers could produce mid- to late-season queens for regional sale, and they would be a bargain at $30 each to local beekeepers. This is a potential business opportunity for those wishing to expand their income stream.

Next
OK, I got sidetracked. I hope to return to the effects of early bee breeding on the realized niche of the honey bee, and how it set the stage for the devastation by varroa.

Acknowledgements
Thanks as always to my long-time collaborator Peter Loring Borst. And especially to those researchers who have done, or are doing, the hard work involved in answering our questions about bee genetics, fitness, and selective breeding.

Footnotes And Citations

[1] Or perhaps not. Some of the ancestral races consist in only a tiny remnant patches http://en.wikipedia.org/wiki/Zea_%28genus%29. Note that despite the fact that although maize is widely planted across the world, I can find no reference to it ever existing in an escaped form. Two interesting and well-illustrated reads on the breeding of corn can be found at http://www.businessinsider.com/the-story-behind-glass-gem-corn-2013-10?op=1 and by Googling "The Ancestry of Corn" by George Beadle.

[2] The benzoxazinoid DIMBOA, a natural insecticide produced by ancestral maize. http://www.wzw.tum.de/index.php?id=185&L=1&tx_ttnews[tt_news]=44

[3] Maize breeders have stored over 135,000 varieties of maize germplasm in seed banks, and draw from the ancestral teosinte species for desirable traits.

[4] With the caveat that some genotypes only work well with some mitotypes.

[5] Kraus, FB, et al (2007) Asymmetric introgression of African genes in honeybee populations (*Apis mellifera* L.) in Central Mexico. *Heredity* (2007) **99,** 233–240. *Open access.*

[6] Actually, various alleles of those genes. In this diagram, I arbitrarily used 8 dots to represent the degree of potential allelic diversity.

[7] In reality, a queen only passes half of her nuclear alleles to an egg, so individual queens would not pass all the alleles shown.

[8] In bee breeding, we use the loosest definition of "hybrid"—intraspecific hybridization between races or breeds of the same species. Intraspecific hybrids are generally fertile, although some may exhibit a lack of fitness, depending upon how closely related the races were.

[9] Pinto, M A, et al (2005) Africanization in the United States: replacement of feral European honeybees (*Apis mellifera* L.) by an African hybrid swarm. Genetics 170:1653–1165. *Open access.* ***This is a great review of the genetic process of Africanization in Texas.***

[10] Jensen, AB, et al (2005) Varying degrees of *Apis mellifera ligustica* introgression in protected populations of the black honeybee, *Apis mellifera mellifera*, in northwest Europe. Molecular Ecology 14: 93– 106.

Quezada-Euán, JJG, et al (2003) Hybridization between European and African-derived honeybee populations (*Apis mellifera*) at different altitudes in Perú. Apidologie 34: 217–225.

[11] O.K., if you've got your reading glasses on and look at wing veination you might be able to.

[12] http://perso.fundp.ac.be/~jvandyck/homage/elver/

[13] Koeniger, G (2005) The neglected gender – males in bees. Apidologie 36: 143–144. http://www.apidologie.org/articles/apido/pdf/2005/02/M36200f.pdf

[14] I am certainly no authority on this subject, and would appreciate knowledgeable feedback if I've gotten something wrong.

[15] Remember that the haploid drones carry only one copy of each gene, whereas the diploid queens and workers carry two copies, and potentially two different alleles.

[16] Muralidharan, K and HG Hall (1989) Evidence from mitochondrial DNA that African honey bees spread as continuous maternal lineages. Nature 339: 211 – 213. *Open access.*

[17] Degrandi-Hoffman, G, et al (2003) Patriline composition of worker populations in honeybee (*Apis mellifera*) colonies headed by queens inseminated with semen from African and European drones. Apidologie 34: 111–120. *Open access.*

[18] Well reviewed in the following papers:

Quezada-Euan, JJG (2000) Hybridization between European and Africanized honeybees in tropical Yucatan, Mexico. II. Morphometric, allozymic and mitochondrial DNA variability in feral colonies. Apidologie 31: 443–453. *Open access.*

Nilza Maria Diniz, NM, et al (2003) Genetic structure of honeybee populations from southern Brazil and Uruguay. Genet. Mol. Biol 26 (1). *Open access.*

An interesting discussion on the "gentle" AHBs in Puerto Rico:

Rivera-Marchand, B, et al (2012) Gentle Africanized bees on an oceanic island. Evolutionary Applications 5: 746–756. *Open access*

[19] Szalanski, AL and RM Magnus (2010) Mitochondrial DNA characterization of Africanized honey bee (*Apis mellifera* L.) populations from the USA. Journal of Apicultural Research and Bee World 49(2): 177-185. *Open access.*

[20] Pinto, op cit.

[21] Pinto, op cit.

[22] Bloch, G, et al () Industrial apiculture in the Jordan valley during Biblical times with Anatolian honeybees. PNAS 107(25): 11240–11244. *http://www.pnas.org/content/107/25/11240.full*

[23] ***For a fascinating read on local adaptation by grazing animals (with a look to the future, and in many ways applicable to bees), see*** Provenza, FD (2008) What does it mean to be locally adapted and who cares anyway? J. Anim. Sci. 2008. 86(E. Suppl.):E271–E284. http://www.journalofanimalscience.org/content/86/14_suppl/E271.full.pdf+html *Something that I found of great interest was local adaptation to toxic plants. Locally-adapted stocks can utilize a greater range of plant forage species during times of dearth, due to their ability to deal with plant allelochemicals. See http://scientificbeekeeping.com/sick-bees-part-18f2-colony-collapse-revisited-plant-allelochemicals/*

[24] Ricketts, TH, et al (1999) *Terrestrial ecoregions of North America: a conservation assessment*. Island Press. From Wikimedia. The key to the name of each numbered ecoregion can be found at http://commons.wikimedia.org/wiki/File:Terrestrial_ecoregions_USA_CAN_MEX.svg. I personally breed for bees adapted to a small portion of Region 41.

[25] Büchler, R, et al (2010) Breeding for resistance to *Varroa destructor* in Europe. Apidologie 41: 393–408. *Open access.*

[26] Bayer, W (1989) Low-demand animals for low-input systems. ILEIA Newsletter 5(4). *Open access.*

[27] Hanotte, O, et al (2010) Time to tap Africa's livestock genomes. Science 328: 1640–641. *Open access*.

Lamy, L, et al (2012) Factors Influencing Livestock Productivity. In V. Sejian et al. (eds.), Environmental Stress and Amelioration in Livestock Production. Springer-Verlag. *Open access. This paper goes into considerable detail as to the sorts of specific adaptations livestock can make to local environmental parameters.*

[28] **Most of the immediately following studies are in a special issue of the Journal of Apicultural Research, and are open access.**

[29] Francis, RM, et al (2014) Effect of genotype and environment on parasite and pathogen levels in one apiary – a case study. Journal of Apicultural Research 53(2): 230-232.

[30] Hatjina, F, et al (2014) Population dynamics of European honey bee genotypes under different environmental conditions. Journal of Apicultural Research 53(2): 233-247.

[31] Costa, C, et al (2012) Differences in colony phenotypes across different origins and locations: evidence for 241 genotype by environment interactions in the Italian honey bee (*Apis mellifera ligustica*). Apidologie 43(6): 634-642.

[32] Dražić, MM, et al (2014) Colony development of two Carniolan genotypes (*Apis mellifera carnica*) in relation to environment. Journal of Apicultural Research 53(2): 261-268.

[33] BÜCHLER, R, et. al. (2014) The influence of genetic origin and its interaction with environmental effects on the survival of *Apis mellifera* L. colonies in Europe. Journal of Apicultural Research 53(2): 205-214.

[34] A gene that is pleiotropic affects more than one trait. In *antagonistic pleiotropy*, there can be a trade-off between the beneficial and the detrimental effects of a single gene. Lobo, I (2008) Pleiotropy: One gene can affect multiple traits. Nature Education 1(1):10. http://www.nature.com/scitable/topicpage/pleiotropy-one-gene-can-affect-multiple-traits-569

[35] This challenge is most evident in areas that are fully Africanized, such as Texas, Arizona, and Southern California, and I commend breeder Danny Weaver on his efforts. Compared to breeding from Africanized stock, selection from indigenous feral European stocks would be expected to be far easier

These articles were originally published in the American Bee Journal. All of Randy's bee articles can be found at: www.scientificbeekeeping.com. If you find these articles of use Randy appreciates donations to fund his efforts.

LETTER TO THE EDITOR

Hi everyone,

I am reaching out on behalf of Capilano Honey to share a wonderful initiative we have recently launched.

Through our newly created 'Keeping Futures' program, last week we announced our Bee a Beekeeper program which offers three beekeeping apprenticeships that are fully funded by Capilano Honey.

You can read all about it here: http://www.capilanohoney.com/au/keeping-futures

We would love for you to spread the word about this great opportunity within your respective associations and encourage school leavers of any age to apply. Perhaps if you think it would be of interest to your Facebook communities you can also share the promo video on your association pages.

You can the video here: https://www.facebook.com/capilanohoney/videos/1015428935242957/

If you have any questions about the program, I am more than happy to help.

Kind regards,

Jessica Berry
Digital & Social Media Manager
+61 (0)7 3712 8282 | +61 (0)476 852 370
399 Archerfield Rd, Richlands QLD 4077

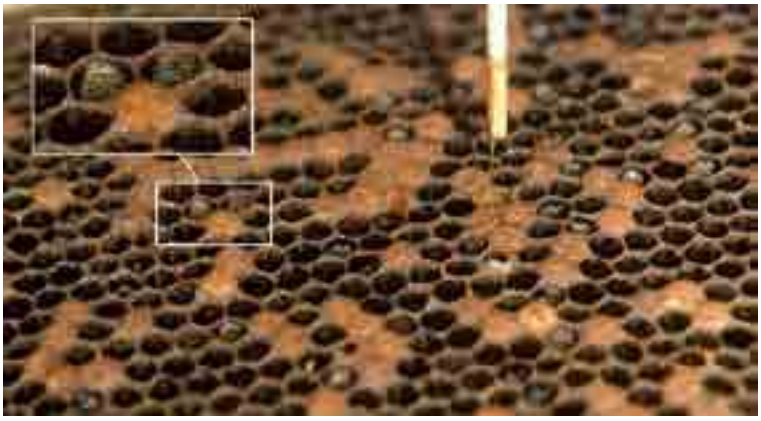
STOLEN HIVES
TAMWORTH

Beekeeper Tony Eden has reported the theft of hives from a TSR site 30 minutes north of Tamworth on the Moonbi Range within sight of the highway. The Hives went missing between 8 - 22 January and the theft has been reported to the police.

DETAILS

Stolen were 52 hives (3xJumbos, 49x10 frame -all doubles)
Jumbos branded E37 plus some of the frames in both lots
10 frame hives branded R38
All painted pastel colours - All full of honey

Could this be happening to your beehives?



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The devastating effect diseases such as American and European Foulbrood can cause is a constant concern for beekeepers.

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Whether our service is used to eliminate current contamination or is used as a preventative measure, Steritech is always happy to help our beekeepers.

From beehives to medical applications, Steritech is there for you.

Steritech is a proud member of the NSWAA

Innovation is driven from ideas

The concept of using irradiation in the beekeeping industry all started with an idea on how to do things a bit differently.

We are constantly trying to develop ways to utilise our processes to help your industry in lots of new ways.

But without your ideas and input, gamma irradiation would not be where it is today.

Come and share your thoughts and ideas with us. You could hold the key to developing a new application that could alter the beekeeping industry forever.

Please contact us about any inspirational ideas you have

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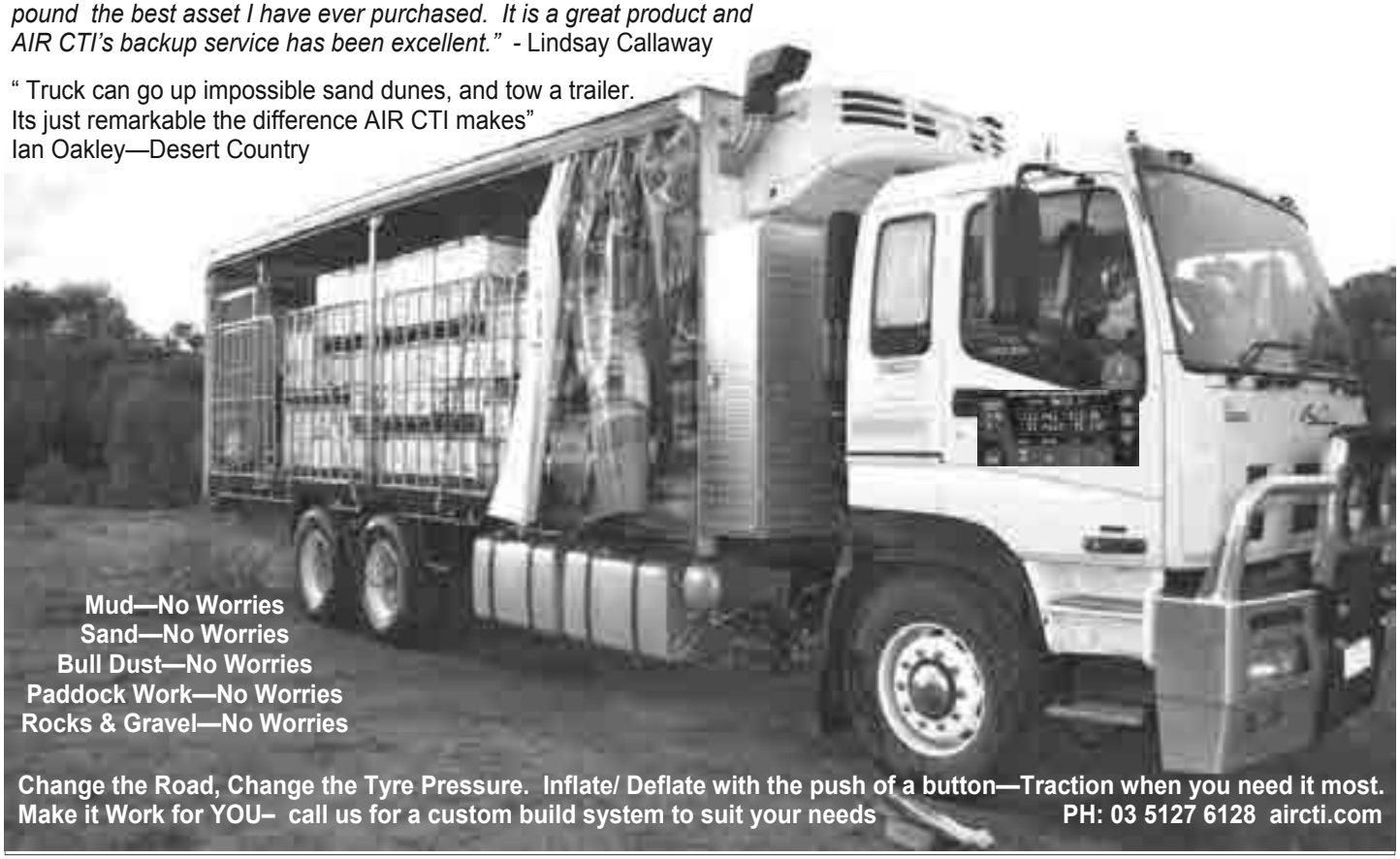

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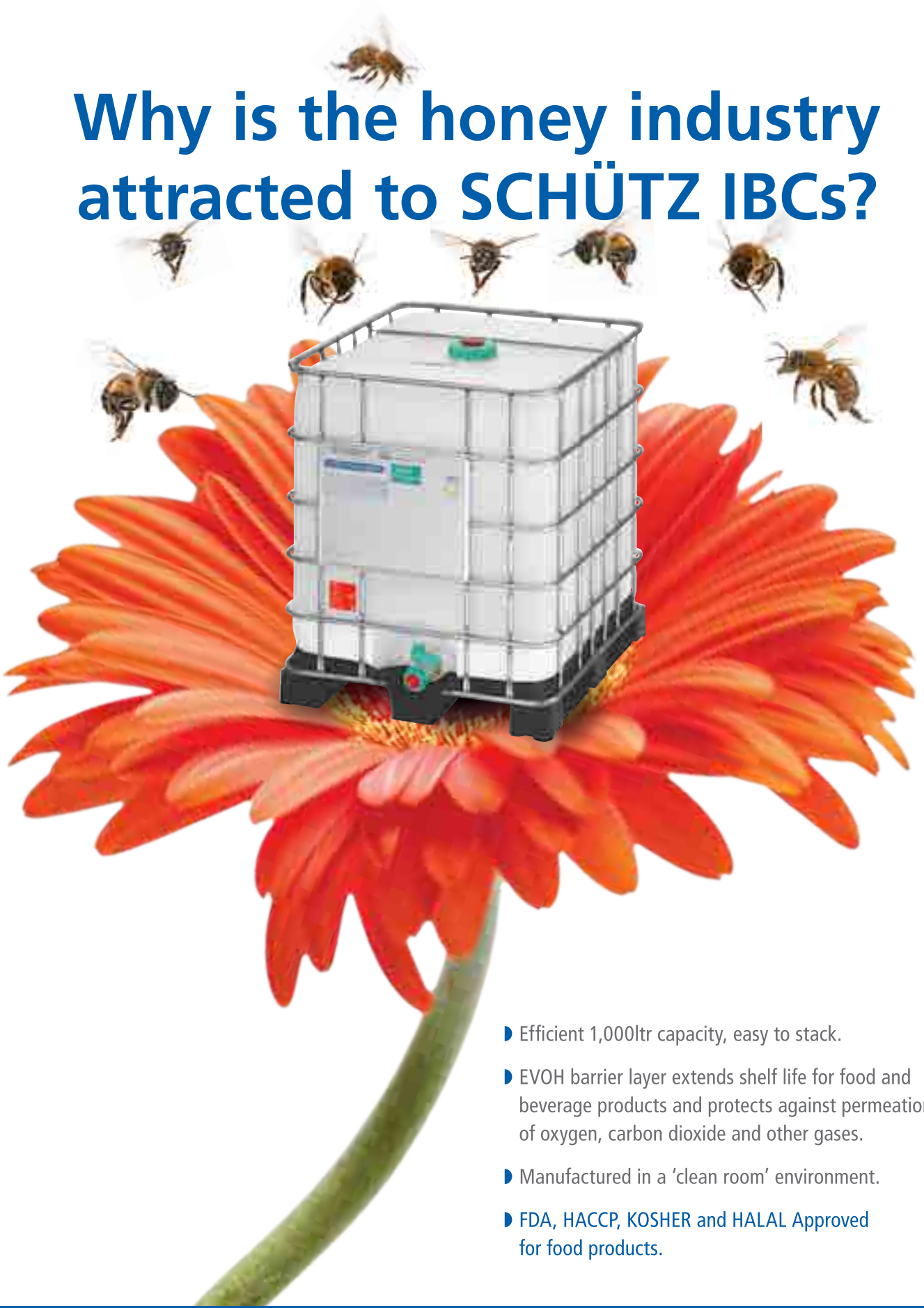

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