BIOSECURITY MANUAL

FOR BEEKEEPERS

REDUCING THE RISK OF EXOTIC AND ESTABLISHED PESTS OF HONEY BEES POST ESTABLISHMENT OF VARROA MITE

VERSION 2.1

SEPTEMBER 2025

Plant Health AUSTRALIA

Australian Honey Bee INDUSTRY COUNCIL

Hort Innovation

AgriFutures Australia

WHEEN BEE FOUNDATION

Plant Health Australia (PHA) is the national coordinator of the government-industry partnership for plant biosecurity in Australia. As a not-for-profit company, PHA services the needs of members and independently advocates on behalf of the national plant biosecurity system. PHA's efforts help minimise plant pest impacts, enhance Australia's plant health status, assist trade, safeguard the livelihood of producers, support the sustainability and profitability of plant industries and the communities that rely upon them, and preserve environmental health and amenity.

www.phau.com.au.

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An electronic copy of this manual is available from the website listed above.

Australian Honey Bee Industry Council (AHBIC) is the national representative body for the honey bee industry www.honeybee.org.au.

The vision of AgriFutures Australia is to grow the long-term prosperity of Australian agriculture through research and development, knowledge and understanding that fosters innovative, adaptive and valuable rural industries www.agrifutures.com.au.

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The Wheen Bee Foundation supports research and education aimed at keeping Australia's honey bees healthy. The foundation advocates for the betterment of beekeeping in Australia and efficient pollination of our food crops www.wheenbeefoundation.org.au.

Australian Honey Bee Industry Council

AHBIC is the peak body for beekeepers in Australia. AHBIC aims to maximise the efficient use of industry resources and funds to ensure the long-term economic viability, security and prosperity of the Australian honey bee industry. AHBIC is funded by voluntary contributions from beekeepers and honey packers.

AHBIC makes representation on behalf of all beekeepers at a national level to all levels of government, private enterprise and public organisations. AHBIC also looks after national issues such as biosecurity, obtaining the best results for beekeepers, maintaining trade access for honey and live bees, representing the industry at various Government Inquiries and communicating information to beekeepers Australia wide, such as this manual.

For more information about AHBIC visit **www.honeybee.org.au**

Consider joining your relevant beekeeping association listed below to support, and to play a role in, the Australian honey bee industry.

New South Wales Apiarists' Association Inc. (NSWAA)

Queensland Beekeepers Association Inc. (QBA)

Victorian Apiarists' Association Inc. (VAA)

Tasmanian Beekeepers Association Inc. (TBA)

South Australian Apiarists' Association Inc. (SAAA)

Bee Industry Council of Western Australia

Australian Queen Bee Breeders Association Inc.

Amateur Beekeepers Association NSW Inc. (ABA)

Crop Pollination Association of Australia Inc.

Honey Packers and Marketers Association of Australia Inc.

All beekeepers, from commercial operators to backyard enthusiasts, form part of the honey bee industry. Every beekeeper has a role to play in protecting honey bees from established and exotic pests and diseases. Beekeeping associations provide an effective avenue of obtaining the latest information on pest and disease management and learning about what is happening in the honey bee industry.

NATIONAL Varroa Mite Management PROGRAM

Funding for the Biosecurity Manual for Beekeepers provided by the National Varroa Mite Management Program

The Biosecurity Manual for Beekeepers is available to download for free from **beeaware.org.au** or by contacting Plant Health Australia at **biosecurity@phau.com.au**

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SEVEN EASY WAYS TO PROTECT YOUR HONEY BEES

BEEKEEPERS HAVE AN IMPORTANT ROLE TO PLAY IN PROTECTING HONEY BEES AND THE ENTIRE HONEY BEE INDUSTRY FROM BIOSECURITY THREATS

Here are seven easy ways to reduce the threat of pests (such as Varroa mite) and diseases (such as American foulbrood) affecting your bees. Each of these practices should be embedded in the everyday management of an apiary as it makes good business sense to reduce the risk of spreading pests and diseases. Don't put your honey bees and the industry at risk by neglecting biosecurity.

1 BE AWARE OF BIOSECURITY THREATS

You and your workers should be familiar with both exotic and established honey bee pest and disease threats. Conduct a biosecurity induction session with staff to explain required hygiene practices for people, equipment, and vehicles in an apiary.

2 USE PEST AND DISEASE-FREE OR CHECKED HONEY BEE STOCK AND APIARY EQUIPMENT

Ensure all queen bees, package bees and apiary equipment are from trusted sources, pest and disease-free or managed to keep Varroa levels under treatment threshold where this pest is established. Keep good records of apiary inputs.

3 KEEP IT CLEAN

Practising good sanitation and hygiene will help prevent the entry, establishment and movement of some pests and diseases within and between apiaries. Workers, visitors, vehicles, equipment, and apiary products such as honey can spread pests and diseases, so make sure materials are free from contaminants and apiary products are contained before entering and leaving the apiary. Please note, sanitation will not assist with the mitigation of Varroa mite entry and increase in the hive.

4 CHECK YOUR APIARY

Monitor your hives and the health of honey bee brood frequently. Report any new or unusual events and pests. Keep written and photographic records of all observations. Constant vigilance is vital for the early detection of any exotic pest or disease threat.

5 TREAT PESTS AND DISEASES IN YOUR HIVES

If you detect a pest or disease in your hives, take the necessary steps to treat or eradicate it. This needs to be done as soon as possible to prevent robber bees from spreading the pest or disease to other hives in your apiary or to the hives of other beekeepers.

6 ABIDE BY THE LAW

Respect and be aware of laws and regulations established to protect the honey bee industry, Australian agriculture and the local region.

7 REPORT ANYTHING UNUSUAL

If you suspect a new pest or disease – report it immediately to the Exotic Plant Pest Hotline.

EXOTIC PLANT PEST HOTLINE

1800 084 881

BIOSECURITY OVERVIEW

This manual is designed to provide information to anyone who keeps honey bees in Australia. All beekeepers, from commercial operators to backyard enthusiasts, to people starting up their first hive, form part of the honey bee industry. Each and every beekeeper has a role to play in protecting honey bees from established and exotic pests and diseases.

Incorporating these recommended biosecurity processes into day-to-day operations is the best way to protect individual beekeepers, regional biosecurity and the Australian honey bee industry as a whole.

WHAT IS BIOSECURITY?

Biosecurity is the protection of livelihoods, lifestyles and the natural environment, all of which could be harmed by the introduction of new pests or diseases, or through the impact of pests and diseases already established in Australia.

Biosecurity is a national priority, implemented offshore, at the border, and within the apiaries and honey sheds. Biosecurity is essential for successful beekeeping.

Australia's geographic isolation has meant that we are partially protected from many of the pests and diseases that affect honey bee industries overseas.

Freedom from these exotic pests and diseases is a vital part of the future profitability and sustainability of Australia's honey bee industry. Biosecurity preserves existing trade opportunities and supports new market access negotiations.

The definition of a pest used in this manual covers all insects, mites and pathogens (diseases) that may harm honey bees. Exotic pests are those not currently present in Australia. Established (or endemic) pests are those present within Australia.

WHAT IS HONEY BEE BIOSECURITY?

Honey bee biosecurity is a set of measures designed to protect your honey bees from the entry and spread of pests. Honey bee biosecurity is the responsibility of every beekeeper and every person visiting or working in an apiary.

Implementing honey bee biosecurity is essential for your business. If an exotic or endemic pest or disease establishes in an apiary, business costs will increase (for monitoring, hive management, treatments and labour), productivity will decrease (yield and/or colony performance) and markets may be lost. The health of the honey bee industry also ensures the continued success of many other plant industries that rely on honey bees for pollination.

Early detection and immediate reporting increases the chance of an effective and efficient eradication.

REGIONAL BIOSECURITY

The biosecurity measures of an individual beekeeper can be enhanced by collaborating with others in a particular region. Through this collaborative approach, biosecurity threats to all apiaries in a region can be minimised.

Promotion of honey bee biosecurity at the regional level can be enhanced through the engagement of the community and by understanding the area's vulnerability, and the potential source and nature of threats. Neighbouring apiaries (managed or abandoned), feral colonies and/or unregistered hives are examples of potential biosecurity threats.

Regional biosecurity efforts are strengthened by identifying what resources and expertise are available, and by having a commitment from stakeholders to implement biosecurity measures and surveillance programs.

Implementation of honey bee biosecurity strategies underpins regional biosecurity, which in turn underpins national biosecurity.

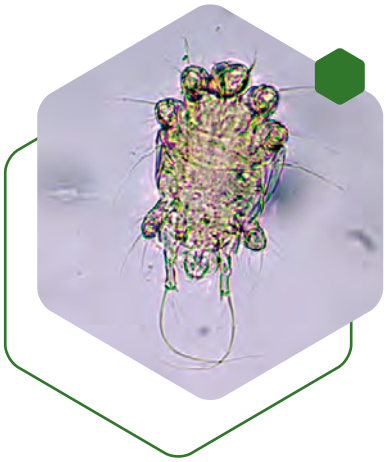
PESTS

EXOTIC PESTS

HIGH PRIORITY EXOTIC PESTS

The following are some key exotic pests that will have serious consequences for honey bees and the Australian honey bee industry should they enter and become established in Australia. Additional information on these pests is included in the fact sheets at the back of this manual.

For information about other exotic pests of the honey bee industry, including detailed pest images, visit the BeeAware website: **beeaware.org.au/pests**



TRACHAEL MITE
(ACARAPIS WOODI)

- Internal parasite of the honey bee respiratory system
- Affects the honey bee's capacity to breathe, resulting in weakened and sick honey bees which have a reduced lifespan
- Symptoms include population decline, bees crawling on the ground and bees holding their wings at odd angles (K wing)
- Accurate identification requires dissection and microscopic examination of the bee's trachea

TROPILAELAPS MITES
(TROPILAELAPS CLAREAE AND T. MERCEDESAE)

- External parasitic mites of worker bees, adult drone, larvae and pupae
- Detection possible by close examination of brood or testing of adult bees
- Symptoms include deformed pupae and adults (stunting, damaged wings/legs/abdomens), parasitic mite syndrome (PMS) and colony decline
- Tropilaelaps mites very efficient transmitters of viruses, further affecting the colony's health and disease susceptibility

EXOTIC PESTS

ASIAN HORNET
(VESPA VELUTINA)

- A 25 mm long hornet with brown or black thorax and bright yellow or orange leg tips. Fourth segment on abdomen is yellow or orange while other segments are bordered with yellow
- Potter wasps, European paper wasps, and mason wasps all have similar colouring
- Nest can be 600-900 mm long with entrance on side
- Asian hornets prey on adult and larval bees. In some cases, hornet attack can result in total collapse of the hive
- Asian hornets have become established in Europe where they have caused a decline in bee productivity and the loss of hives

GIANT HONEY BEE
(APIS DORSATA)

- Largest of the honey bee species (17-20 mm long) and similar in appearance to the European honey bee
- Widely distributed through south-east Asia, India, and China
- Produces a large single comb, 1.5 m wide and 1 m deep. Colonies can be made up of 60,000 bees
- Nests are built in exposed places far off the ground
- Can migrate up to 200 km in a single season. Is a proven host of the Tropilaelaps mite

DWARF HONEY BEE
(APIS FLOREA & APIS ANDRENIFORMIS)

- World's smallest honey bees, only growing to 10 mm
- A. florea have a thick red/orange thorax and alternating dark brown and white abdominal banding
- A. andreniformis have a thick black thorax, following alternating dark brown and white abdominal banding
- Both are social species and live in colonies of approximately 3,000 bees
- Dwarf bees are competitors for other pollinating species. They can spread mites and diseases

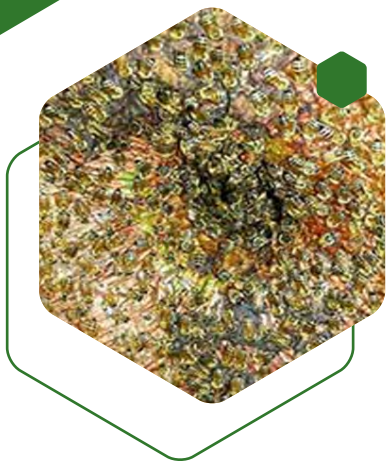
LARGE HIVE BEETLE
(OPLOSTOMUS FULIGINEUS)

- Large 20-23mm long, shiny black beetle which is native to Africa
- Feeds on honey bee brood in preference to honey and pollen. Quickly destroys comb structure
- Unlike Small Hive Beetle, cannot reproduce in the honey bee colony and requires decomposing plant material (commonly cattle dung) for oviposition and development
- Larger than a honey bee and is managed in Africa by restricting hive entrances

EXOTIC PESTS

CAPE HONEY BEE
(APIS MELLIFERA CAPENSIS)

- Subspecies of European honey bee. Native of the Eastern and Western provinces of South Africa
- Generally darker and smaller than other races of European honey bees
- Swarms and absconds much more frequently than other races of European honey bees. Cape honey bee will swarm every month or two
- Flighty and will abscond during a hive inspection
- Produces less honey than other European honey bees
- Unlike the Africanised honey bee it is quite docile



AFRICANISED HONEY BEE

- Hybrid of several European honey bee subspecies (*Apis mellifera mellifera, A. m. carnica, A. m. caucasia, or A. m. ligustica*) and the African honey bee (*A. m. scutellata*)
- Occurs naturally throughout sub-Saharan Africa and has colonised Central and South America and established in many southern states of the USA
- Africanised honey bees have a much greater aggressive and defensive behaviour than European honey bees

PRIORITY ESTABLISHED PESTS

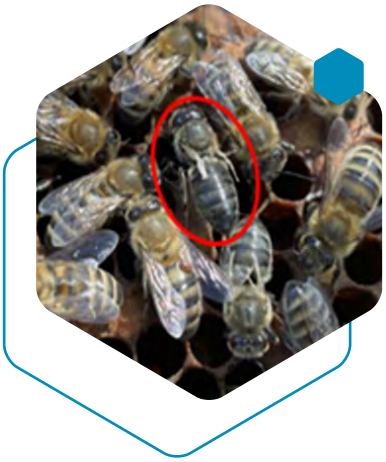
Pests in this category are established in Australia at the time of updating this manual. They affect the strength and productivity of the honey bee colony, incurring added costs involved in their monitoring and management. Additional information on these pests is included in the fact sheets at the back of this manual.

For more information on each of these pests, visit the BeeAware website **beeaware.org.au/pests**

VARROA MITES
(VARROA DESTRUCTOR)

- Varroa mites can be seen with the naked eye but are difficult to spot. They are 1.1 mm long by 1.7mm across and look like red-brown eight-legged sesame seeds
- Varroa mites can only reproduce on bee brood. The presence of drone brood dramatically escalates a mite population. Mites find drone brood more attractive for reproduction than worker brood
- Female mites enter the brood cell just before capping, feed on primary body fat tissue and lay up to six eggs
- The first egg laid is male and the subsequent eggs are female. The male mates with its sisters as they mature
- Symptoms of heavy infections include disoriented worker bees, inability to maintain stores, rapid colony decline and parasitic mite syndrome
- Without intervention, Varroa mites will kill a honey bee colony

NB: V. jacobsoni and other Varroa species remain exotic



VARROA MITES AND HONEY BEE VIRUSES

Varroa mites vector honey bee viruses. In the absence of Varroa, viruses are considered a minor problem

Endemic viruses include:

- Kashmir bee virus
- Sacbrood virus
- Isreali acute paralysis virus
- Lake Sinai virus 1 and 2
- Rhabdovirus 1 and 2
- Black queen cell virus

Best known in association with Varroa mite is the exotic Deformed wing virus A and B which causes crippled wings and shortened abdomen in heavily infested honey bee colonies. Acute bee paralysis virus and Slow bee paralysis virus are also exotic.

ESTABLISHED PESTS

AMERICAN FOULBROOD
(PAENIBACILLUS LARVAE)

- Brood disease caused by a bacterium that is ingested by bee larvae (less than 3 days old) and results in the larvae dying of starvation after cell capping
- Symptoms include sunken and discoloured, sometimes greasy, cell cappings with perforations and an irregular brood pattern
- Decaying infected larvae may be roped to a distance of 25 mm or more (pictured left)
- Infection weakens the hive making it susceptible to robbing. Spread to other bee colonies will be fatal in most cases
- Bacterium is very infectious; spores can remain dormant for over 50 years and can occur on components of infected hives

ASIAN HONEY BEE
(APIS CERANA JAVA GENOTYPE)

- Invasive and adaptive strain of Asian honey bee (AHB)
- Similar appearance to the European honey bee, although is slightly smaller, has more pronounced stripes on its abdomen and has an erratic flying pattern
- AHB cannot be managed for honey production or pollination, due to its frequent swarming and tendency to abscond
- Robs European honey bees of their honey stores and competes for floral resources

BLACK QUEEN CELL VIRUS
(CRIPAVIRUS)

- Virus that causes mortality in queen bee larvae or pre-pupae
- Queen bee larvae or pre-pupae die after capping. The dead larvae or pre-pupae and the queen bee cell wall turn brown- black
- Symptoms reflect the appearance of worker bee larvae killed by sacbrood virus
- Black queen cell virus may be transmitted by *Nosema apis*

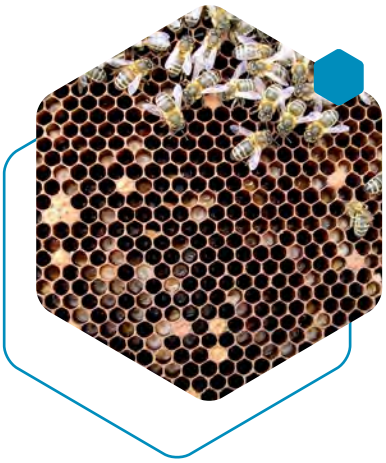
BRAULA FLY
(BRAULA COECA)

- The braula fly lives in honey bee colonies and moves to honey bee mouth parts where it feeds on nectar and pollen
- Prefers to attach itself to queen bees in times of nectar dearth and this can decrease the efficiency and egg laying capability of queen bees
- Braula larvae tunnel under honey cappings which give honey comb cappings a fractured appearance
- Won't necessarily be detected using an alcohol wash

ESTABLISHED PESTS

CHALKBROOD DISEASE
(ASCOSPHAERA APIS)

- A fungus that is ingested by bee larvae causing death by starvation
- Symptoms include scattered brood with perforated cappings
- Larvae die after the cell is capped and become covered by the white/grey fungus, causing the diagnostic ‘mummies’
- Incidence is usually greater when the colony is under stress due to cool weather or poor nutrition



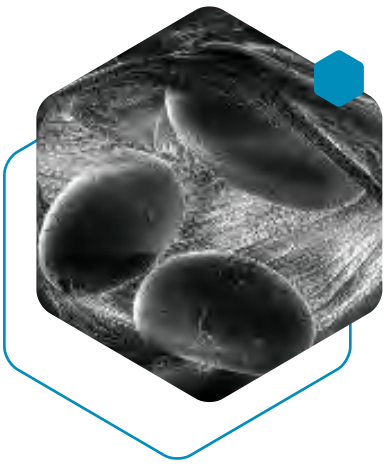
EUROPEAN FOULBROOD
(MELISSOCOCCUS PLUTONIUS)

- A brood disease caused by a bacterium that is ingested by honey bee larvae and results in the larvae dying of starvation or undersized adult bees as it competes with larva for food
- Symptoms include spotted brood pattern intermingled with healthy brood, sunken and dark cappings and a foul smell
- Infected larvae often die before their cells are capped in a twisted position and become yellow-brown and dry brown scale that is easily removed from the cell
- Incidence is usually greater when the colony is under stress due to cool weather or poor nutrition

GREATER WAX MOTH *(GALLERIA MELLONELLA)* & LESSER WAX MOTH *(ACHROIA GRISELLA)*

- Pests of weak and stressed colonies and combs in storage
- Both moths are a similar grey colour and tend to coexist in the same location (greater wax moth pictured)
- Both species prefer brood combs and eat wax, pollen and remains of larval honey bees, leaving behind silk webbing and silk lined tunnels
- Larvae chew canoe-like cavities on wooden frames and hive boxes in which they spin their white silk cocoon

ESTABLISHED PESTS



NOSEMA
(NOSEMA APIS AND N. CERANAE)

- Disease caused by two species of microsporidian parasites which can infect drones, workers and queen bees
- Spores germinate in the adult bee gut causing a shortened life-span, a sometimes rapid reduction in the number of adult bees, poor honey production, reduced brood production and dysentery in and around the hive
- Infected bees show no specific disease symptoms
- Heavy losses of bees and colonies may occur in autumn, winter and spring

SACBROOD VIRUS
(IFLAVIRUS)

- A virus that affects bee larvae after consuming contaminated brood food, water, pollen or nectar
- Symptoms include scattered dead brood with discoloured, sunken or perforated cappings
- The larvae die with their head characteristically raised in a banana shape toward the top of the cell
- Infected larvae die shortly after capping and have a yellowish appearance as they become a fluid filled sac. The skin of dead larvae changes into a tough plastic-like sac

SMALL HIVE BEETLE
(AETHINA TUMIDA)

- Larvae of this brown-black beetle consume honey bee eggs, brood, pollen and honey
- The larvae chew through the combs causing the honey to ferment and the hive to become ‘slimed out’
- Larvae can also consume combs of honey removed from the hive for extraction
- Large numbers of small hive beetle can result in the death of the colony or the colony absconding

Pests that are established in regions of Australia may still be reportable in states or territories in which they are present, as well as those from which they are currently absent. Know which of these established pests are reportable for your region and consult your local department of agriculture if you detect them.

If you detect an exotic pest in your hive, contact your local department of agriculture immediately or call the Exotic Plant Pest Hotline on 1800 084 881.

CODE OF PRACTICE AND NATIONAL BEE BIOSECURITY PROGRAM

THE CODE

In an effort to improve the management of established pests and diseases, as well as increase the preparedness and surveillance for exotic pest threats, the Australian honey bee industry, through the Australian Honey Bee Industry Council (AHBIC), has developed a national Biosecurity Code of Practice (the Code). The Code was developed in 2015 in consultation with beekeepers and governments to provide a clear framework for Australian beekeepers to engage in best-practice biosecurity. The objectives of the Code are to:

The Code has been developed to incorporate fundamental biosecurity principles into the practices of all Australian beekeepers. It describes the outcomes you need to achieve for good pest and disease prevention and control. It is not a manual on how to keep bees: the Code tells you what biosecurity outcomes you need to achieve but how you achieve them will be up to you and will be influenced by your situation.

The standards set in the Code are not onerous – they are simply standards that all beekeepers should be doing to minimise the impact of pests and diseases on their hives and those of their fellow beekeepers. Quality assurance (QA) programs report that they are now aligned to the requirements of the Code.

To download the Code and learn how you can incorporate these practices into your hobby or business, contact your local department of agriculture or visit the BeeAware website beeaware.org.au

NATIONAL BEE BIOSECURITY PROGRAM

NATIONAL Varroa Mite Management PROGRAM

NATIONAL BEE BIOSECURITY PROGRAM

The National Bee Biosecurity Program is a national partnership between the Australian honey bee industry, Plant Health Australia (PHA) and state governments that promotes best management practices for beekeepers in Australia.

To ensure that Australian beekeepers are following appropriate biosecurity practices, the Program aims to have a Bee Biosecurity Officer (BBO) in each state. These positions are within relevant state agencies e.g., department of primary industry (DPI), funded by a combination of beekeeper levies and state government contributions.

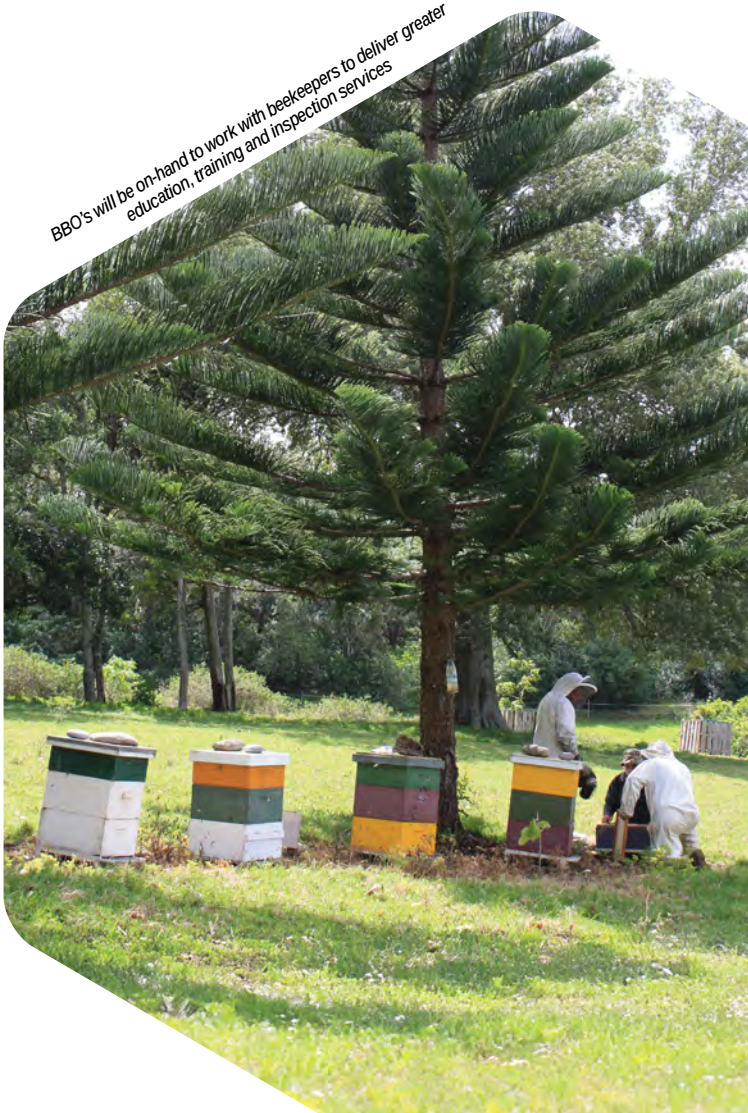
The role of a BBO is to provide extension services for industry, training and education for beekeepers and to assist industry with compliance with the Code. The work plans and milestones of the BBO are determined in consultation with state beekeeping associations, PHA and state DPI's. This ensures that industry helps drive the Program and has ownership of what the program is aiming to achieve.

In the event of an incursion of an exotic pest, such as occurred with Varroa mite in 2022, a BBO will be on hand to provide expert support to industry and provide training and education for beekeepers.

For more information about the National Bee Biosecurity Program, and to access resources to help beekeepers comply with the Code (such as online training and record keeping templates) visit the BeeAware website **beeaware.org.au**

NATIONAL VARROA MITE MANAGEMENT PROGRAM

The two-year, National Varroa Mite Management Program, was established in 2024. It placed strong emphasis on building industry resilience and preparedness and increasing beekeeper and industry knowledge. The program included state and territory-based Varroa Development Officers who assisted beekeepers in understanding how to manage the Varroa mite pest. Varroa Development Officers assisted with training, monitoring and reporting actions, integrated pest management, record keeping and different treatment methods including mechanical, chemical, and organic treatments. Dynamic mapping, showing the extent of Varroa mite spread, is a legacy of the program.



KEEPING HONEY BEES HEALTHY

CONTROLLING PESTS AND DISEASES

Many beekeepers in Australia move their hives for pollination contracts and to follow honey flows. This movement of hives, as well as the drifting and robbing habits of honey bees, means that the spread of pests and diseases can be difficult to prevent or contain. However, the adoption of the following biosecurity measures in day-to-day management practices will help minimise the risk of pest and disease transmission between honey bee colonies and apiaries.

PURCHASE CLEAN HIVES AND EQUIPMENT

- Only purchase second hand hives and equipment from beekeepers who regularly check for established and exotic pests and diseases.
- If possible, examine the colony and hive parts before purchase to ensure they meet the required standard and are pest and disease free. Ask the seller for a vendor declaration: **www.honeybee.org.au/doc/vendordecform.doc**
- Isolate purchased hives for up to 12 months until you are satisfied of their health status.
- Sterilise or irradiate second hand beekeeping equipment before use in your apiary.

CLEAN APIARY EQUIPMENT REGULARLY

- Clean smokers, hive tools and other apiary equipment of any accumulations of wax, propolis or honey before commencing work at each new apiary, particularly if any pest or disease is suspected.
- Always clean and sanitise extracting machines, drums or containers before and after use.
- Ensure honey containers are cleaned inside and out and dried and sealed before use.

DISPOSE OF WASTE MATERIAL EFFECTIVELY

- Make sure that honey spills, exposed combs and wax are destroyed or covered to prevent robbing by honey bees. Robbing is a direct pathway for brood disease and virus spread.
- Maintain good hygienic practices around the apiary and remove and contain beeswax scraps, old combs and dead-out hives, which can attract and harbour pests and diseases.

A clean, well managed apiary

IMPLEMENT A HEALTH PROGRAM

- Obtain sound information and understand the pest and disease risks for each hive and apiary.
- Develop appropriate measures for pest and disease control and record all treatment details.
- Implement a barrier management system to reduce the risk of spreading pests and diseases within and between apiaries.
- Control swarming in colonies by providing extra brood space for the colony during build up and remove queen cells to keep the colony population strong and healthy.
- Regular comb replacement can lead to improvement in the health of your honey bees and reduce chemical residues in the brood box (post use of a Varroa mite control). Brood combs should be removed entirely and replaced with new foundation or stickies at least once every three years.
- Requeen colonies every two years with young and healthy queens from a reputable breeder.
- Monitor for Varroa mite at regular intervals that align with your state/territory's regulations and the Australian Honey Bee Industry Biosecurity Code of Practice.

All pest and disease (exotic and established) surveillance activities on the property or apiary should be recorded. These records can be used in the response to an incursion to inform management practices as well as provide support to industry surveillance activities.

INSPECTING HIVES

It is critical to inspect all hives on a regular basis, especially the brood. This is an important practice to determine the presence or absence of many established pests and diseases within Australia. It is also an important precautionary measure for beekeepers to identify any exotic pests that may be in their hives. The following are general guidelines for inspecting hives.

GETTING STARTED

- Examine the brood and colony at regular intervals, especially in areas where Varroa mite is established.
- Make sure that the circumstances are suitable to inspect the colony. For instance, do not start your inspection if the weather is likely to turn wet or cold, or if there are people or animals in the vicinity.
- Assess the level of activity at the entrance of the hive. Observe whether honey bees are flying, if there are dead honey bees at the entrance, or if honey bees are bringing in pollen.
- Keep records of your inspections and write down any occurrence, or suspicion of disease. If anything suspicious is observed, report it immediately to the Exotic Plant Pest Hotline 1800 084 881.
- Always be calm and methodical when inspecting hives and try to avoid any sudden or sharp actions.

Preparing the hive for inspection

OPENING THE HIVE

- Apply smoke into the hive entrance.
- Work the hive from the side or rear.
- Remove the hive lid and any supers and place them to the side of the hive.
- Use your smoker sparingly to control the bees – too much smoke may excite or distress the bees.
- If the hive has a queen excluder, carefully remove it with the aid of a hive tool.
- Clean up any brace/burr comb or propolis from the queen excluder on the top of frames and place in a sealed container that can be taken away with you. Do not discard this on site as honey bees could rob this material which could spread pests and diseases.
- Remove an end frame, and if the queen is not present, place on the side of the hive to give more space to remove the centre frames without damaging the honey bees.

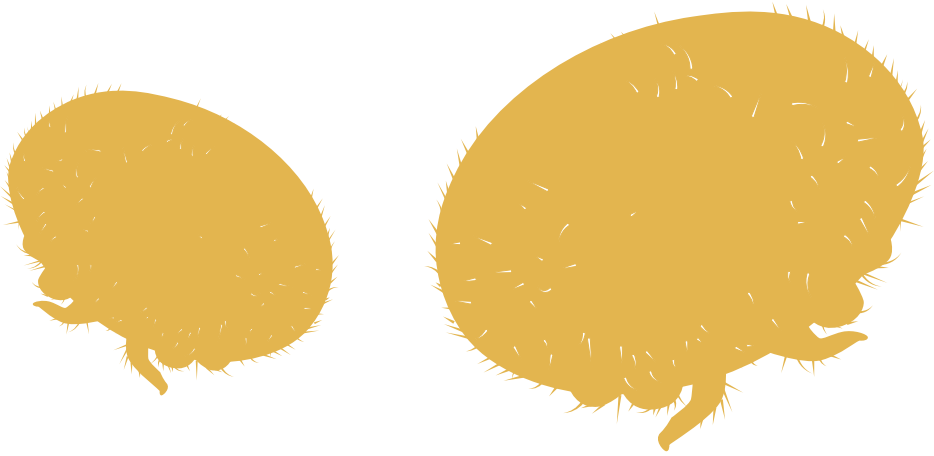
Opening up the hive

Removing the brood frame

INSPECTING THE HIVE

- Remove a brood frame (without the queen bee) and shake most of the honey bees back into the hive or at the hive entrance, leaving the brood comb clear for inspection.
- Hold the frame by the top bar, rotate and inspect the brood thoroughly.
- Look for symptoms associated with established pests and diseases of honey bee colonies.
- Look for any queen cells on the comb surface and bottom side of the comb, and if present, remove to reduce swarming potential.
- Repeat this for all brood frames.
- Place combs back in the same sequence and orientation as they were at the start of the inspection, unless you have planned to manipulate the combs for a management reason.
- Make sure that the frames are tightly pushed together to provide the correct bee space.
- Record what you observe and note any pests and diseases that you have identified. Look at possible control or management options.

Inspecting brood comb



VARROA MITE DETECTION AND MANAGEMENT

The Varroa mite fact sheet at the end of this manual provides information on mite identification and spread. *Varroa destructor* was identified as present in NSW in June 2022 and transition to management commenced in September 2023. It is expected that most regions in Australia will be managing Varroa mite in future years. Techniques described in this section are also relevant to the detection of exotic mites such as tropilaelaps.

VARROA MITE TESTING AND TESTING FREQUENCY

Under the Australian Honey Bee Industry Biosecurity Code of Practice all beekeepers are required to inspect their hives for mites at regular intervals. Inspection frequency is determined by relevant state and territory regulations. Varroa mite is a notifiable pest, positive detection results should be reported to biosecurity in your local jurisdiction.

Any of the following monitoring methods can be used to test for the presence of Varroa mite:

- Alcohol wash
- Soapy water wash
- Sugar shake
- Miticide strips and sticky mats*
- Drone brood uncapping*

  ** drone brood uncapping and sticky mats are suitable for mite detection - ONLY alcohol/soapy water wash or sugar shake methods allow the beekeeper to estimate the overall mite infestation in a colony which informs Varroa management and treatment decisions.*

A short instructional video on how to carry out an alcohol wash is available at **www.beepestblitz.com.au** Additional fact sheets and instructional videos about how to complete Varroa mite tests, as well as other surveillance methods for exotic pests visit the BeeAware website **beeaware.org.au/**.

HOW MANY HIVES SHOULD I TEST?

For small apiaries with fewer than 10 colonies, all colonies should be tested for Varroa mite. For apiaries with more than 10 colonies, 10% of colonies in each apiary should be tested. If possible, include colonies from the centre as well as the edges of the apiary (NSW DPI Primefact - Varroa Mite Management Options, June 2024).

INTEGRATED PEST MANAGEMENT

Managing Varroa mite is more than just applying miticide strips within a hive. Integrated Pest Management (known as IPM) uses a variety of techniques to keep Varroa mite numbers below a level where they cause economic damage to the colony and the beekeeper.

IPM involves:

- Understanding the Varroa mite lifecycle.
- Rigorously monitoring Varroa levels and evaluating results.
- Applying IPM controls appropriate to your beekeeping operation, environment, and colonies' development phase if Varroa levels are too high.
- Evaluating the effectiveness of your chosen management method.
- Continuing monitoring and management as much as necessary, rotating different types of chemical controls to prevent Varroa from developing resistance to treatment.

VARROA SYNTHETIC AND ORGANIC CHEMICAL TREATMENT TABLE

A current Varroa chemical treatment table outlining product registration status, active ingredient, dose, ambient temperature requirements, whether treatment can occur with supers on hives, treatment time, and withholding periods has been prepared by AHBIC and is available at **honeybee.org.au/ahbic-varroa-treatment-table/**.

Varroa chemical treatments can leave residues in beeswax and hive products. Consequently, it is important that beekeepers manage risks to prevent residues in saleable products.

RECORD KEEPING

Along with regular hive inspections and Varroa mite monitoring, accurate record keeping by beekeepers is an important addition to managing hives with Varroa.

Records should include:

- Where your bees have been
- How long for
- Movement of supers
- Purchase or sale of queens/nucs/hives
- Treatment used for varroa or any other pest
- Results of monitoring after pest treatments are removed.

The BeeAware website has a variety of record templates for beekeeper use.

EXOTIC PLANT PEST HOTLINE
1800 084 881

PEST SURVEILLANCE

IMPORTANCE OF PEST SURVEILLANCE

Apiary monitoring and surveillance involves looking for and recording the presence, absence and population levels of pests. Regular monitoring is a fundamental part of honey bee management practices and gives the best chance of spotting exotic or established pests soon after they arrive.

Pest surveillance is necessary because of:

- **Market access:** Export destinations for honey bees can require 'evidence of absence' data for exotic and some established pests that are of concern. The Australian honey bee industry, in collaboration with governments, must prove through surveillance that exotic and/or established pests have been looked for and shown to be absent.
- **Exotic pest eradication:** Early detection of exotic pests improves the chance of eradication or containment within a region. However, if eradication or containment is not feasible, early detection, in conjunction with contingency planning and preparedness by government and industry bodies (e.g. preparing emergency chemical registrations, awareness material and training in pest diagnostics) assists with more rapid and effective response management.

REPORT SUSPECT PESTS OR SYMPTOMS

Reporting of any suspect pests or symptoms may prevent or minimise long-term damage to the honey bee industry and reduce any quarantine period that an apiary, or apiaries, are placed under.

When inspecting hives, look for unusual symptoms such as poorly formed honey bees with deformed wings (right), thoraces and/or abdomens as well as general colony symptoms of rapid population decline, or a low bee to comb to brood ratio. Also be aware of any mites that are observed on the honey bees or in the brood.

Calls to the Exotic Plant Pest Hotline will be forwarded to an experienced person in the state or territory government, who will ask some questions about what you have seen and may arrange to collect a sample.

Do not send samples without first speaking to someone from the state or territory department of agriculture, who can discuss the correct type of sample, its packaging, handling and transport to the laboratory assigned for diagnosis.

In some states and territories, the Exotic Plant Pest Hotline operates only during business hours. Outside these hours, leave your full contact information and a brief description of the issue and your call will be followed up as soon as possible. Every report will be taken seriously and treated confidentially.

If you suspect you have an exotic pest, the following general precautions should be taken immediately to contain the pest and protect your apiary:

- Mark the hive or area where the pest was found. Limit access of people and equipment to the apiary and surrounding area.
- Wash hands, clothes, apiary equipment and vehicles that have been in contact with the suspect hive/s or apiary. Make sure sick or infested honey bees are not removed from the apiary.
- Stop beekeeping operations immediately while waiting for the identification of the suspected exotic pest.

If you observe any unusual symptoms or detect any mites on your honey bees or in the brood report it immediately via the Exotic Plant Pest Hotline on 1800 084 881.

Worker European honey bee with wing deformities as a result of varroa infestation

If a suspected or confirmed honey bee Emergency Plant Pest (EPP) is identified, you should follow the simple guidelines listed below:

- Always follow the relevant state or territory regulatory requirements and the directions given by the state or territory apiary inspectors.
- Do not move, or attempt to move any hives, machinery, or equipment from the premises or apiary site.
- Always adhere to any movement restrictions that apply to hives, honey bee products, machinery or equipment within the Control and Restricted Areas.
- If requested, provide the relevant state or territory apiary inspector with a list of known beekeepers who own hives within the Control and Restricted Areas or Quarantine Zone.
- It is important to work with state or territory apiary inspectors. Emergency containment and preserving the ability to eradicate the EPP is the first priority for everyone involved.

Following these guidelines provides the best protection for every beekeeper and the entire honey bee industry.

EMERGENCY RESPONSES

In Australia, both industry and governments have a role to play in managing and funding emergency responses aimed at eradicating exotic pests and diseases.

Incursions by pests and diseases that are deemed to be Emergency Plant Pests (EPPs) are dealt with under the terms of the Emergency Plant Pest Response Deed (EPPRD).

The Australian Government, all state and territory governments and the major plant industry bodies have signed the EPPRD, along with Plant Health Australia, the custodian of the agreement.

Under the EPPRD all decisions are made by committees that include government and industry representatives. The decisions of the Consultative Committee on Emergency Plant Pests (CCEPP) relate to the technical feasibility of eradication of the pest in question. Decisions of the National Management Group (NMG) are made on technical advice from the CCEPP and financial considerations.

The EPPRD sets out arrangements that automatically activate when a suspected EPP is detected in Australia, allowing swift and effective action. The fast response time is required to provide an opportunity to eradicate the pest or disease.

Sampling honey bees for viruses

WHAT HAPPENS IF AN EXOTIC PEST OR DISEASE IS CONFIRMED

Within 24 hours of the initial identification of an exotic pest or disease, the relevant state agency, through the State Chief Plant Health Manager, will inform the Australian Chief Plant Protection Office who will notify all state agencies, relevant industry representatives and Plant Health Australia.

The relevant state or territory agriculture agency will seek a confirmatory diagnosis from another laboratory, usually within a different jurisdiction.

If the pest or disease is considered potentially serious and/or suspected to be an Emergency Plant Pest (EPP), the relevant state/territory agriculture department will usually adopt precautionary emergency containment measures. These measures, depending on the pest, may include:

- restricted access to the area
- a hive standstill or quarantine
- restriction of operations in the area
- withdrawal of people, vehicles and machinery from the area
- control or containment measures.

If an EPP is confirmed, technical and economic considerations are reviewed, and a decision made whether to:

1. Attempt to eradicate, which would be managed under the Emergency Plant Pest Response Deed (EPPRD) and a Response Plan
2. Take another course of action, such as to contain or do nothing and accept potential long-term management of the pest.

The Australian Honey Bee Industry Council (AHBIC) has signed the EPPRD, giving the industry a seat at the decision-making table in the event of an incursion that affects the honey bee industry.

Since the industry benefits from a response to eradicate new pests or diseases that would compromise production, AHBIC covers a proportion of the costs of an approved Response Plan by having appropriate biosecurity levy arrangements in place.

Also, under the conditions of the EPPRD, the honey bee industry (including members of AHBIC) has a responsibility to report suspect pests or diseases.

For more information on the EPPRD and emergency responses, go to **planthealthaustralia.com.au/epprd**

OWNER REIMBURSEMENT COSTS

Without early reporting, eradication efforts can be futile as the pest or disease is too widespread and established in the environment. In these cases, beekeepers then have to manage the pest or disease as endemic, leading to permanent increases in production costs.

To encourage early reporting and improve the chance of successful eradication, the EPPRD allows for payments to beekeepers who can demonstrate financial losses or costs incurred as a result of an effort to eradicate an EPP. Owner Reimbursement Costs (ORCs) may cover costs associated with Response Plan actions, such as the destruction of hives, honey and additional chemical treatments. Their purpose is to reduce the financial impact of the eradication response on the beekeeper.

ORCs apply only to approved Response Plans aimed at eradication, and only to industries that are signatories to the EPPRD, like the honey bee industry.

ORC Evidence Frameworks are developed for each agricultural sector to provide extra guidance and a hierarchy of evidence is used to determine specific ORC valuations. The honey bee industry has already developed their evidence framework for ORCs. It is available from *planthealthaustralia.com.au/orc*

PRODUCT MANAGEMENT

Queen cell cages

POLLINATION

When placing hives in a crop for pollination, it is recommended that beekeepers and growers use a pollination agreement to specify expectations and the responsibilities of both parties.

Large scale pollination events draw colonies from multiple locations and have a history of creating biosecurity “hot spots” (pest spreading opportunities). It is important that beekeepers bringing colonies to these events manage their pests and diseases, especially AFB and Varroa, and do not create pest problems for other beekeepers.

Visit the BeeAware website for more information **beeaware.org.au**

Hives pollinating almonds

QUEEN BEES AND PACKAGE BEES

Use healthy queen bees and package bees (i.e. tested for the presence of pests and diseases) from reputable breeders. This assists in managing biosecurity risk as it is hard to visually assess the health of purchased queen bees or package bees. Viruses, bacteria and mites may be present but not induce symptoms under some circumstances.

To minimise the risk of introducing pests or diseases into an apiary:

- Obtain queen bees and package bees only from a business that takes biosecurity, hygiene, health testing and record keeping seriously.
- Thoroughly check package bees, queen bees and the brood that is produced within one month of arrival.
- Maintain a register of the apiary’s purchased queen bees and package bees, including their source (with contact details), breed/strain, locations, what was bought and the receival date.

HONEY AND SPECIALIST PRODUCTS

Honey, comb honey, wax, pollen, royal jelly and propolis are all specialist products that are produced by beekeeping operations in Australia. In order to produce honey and specialist products of the highest standards, beekeepers should follow Varroa mite chemical treatment instructions as well as industry best management practice guidelines. Best practice guidelines are outlined in quality assurance schemes.

To minimise the environmental impacts of beekeeping, you should follow the guidelines that are published in the National Best Management Practice for Beekeeping in the Australian Environment which was published by AHBIC, the Australian Government and NSW DPI in 2007. This report is available at honeybee.org.au/pdf/NBPFBIAE.pdf

Recording observations and inspections in an apiary

Frame of honey comb

RECORD KEEPING

Good record keeping is an important part of any hobby or business and complete records should be kept of all biosecurity actions (especially chemical treatments for the control of Varroa) and observations. Hives or groups of hives should be clearly identified, and accurate records of movements kept for traceability.

Accurate records are also critical if a beekeeper becomes affected directly, or indirectly, by the incursion of an exotic pest and a subsequent Response Plan.

A variety of record templates are available from the BeeAware website beeaware.org.au for download.

BIOSECURITY AND QUALITY ASSURANCE

BARRIER SYSTEMS

A major method of disease spread within an apiary or between apiaries is through the transfer of infected material between hives prior to disease symptoms being detected. A well-managed barrier system will contain potential spread to within defined units, and enable you to trace both the source and spread of a disease, which will help with management and eradication efforts.

A barrier system is a method of dividing apiaries into smaller sub-units to ensure there is no transfer of potentially infected materials between the sub-units. The overall purpose is that hives and hive components in one sub-unit are not interchanged with those from another sub-unit, however, how the barrier system is implemented will depend on the individual circumstances of the enterprise. Good record keeping and forward planning is essential, and all people working with the hives must understand how the system works for it to be effective.

The adoption of a barrier system will enhance traceability, biosecurity and quality assurance aspects of the beekeeping enterprise, as well as build upon best practice principles.

Barrier management systems alone are not a replacement for good beekeeping and good pest monitoring and management.

QUALITY ASSURANCE PROGRAMS

Auditable quality assurance (QA) programs can be valuable to commercial beekeepers with benefits to biosecurity, market access, meeting specifications, customer expectations and food safety. There are a variety of private QA programs that can be adopted, as well as the industry owned QA program, B-QUAL. If an apiary business is accredited with a QA program it is likely that some fundamental techniques of biosecurity best practice are already being applied.

QA programs are underpinned by best beekeeping and processing practices, which have been backed by research into hygiene, quality and chemical residues. Quality standards have been developed for apiary operations, extracting and packing plants, biosecurity procedures, organic production and other specialised activities.

BIOSECURITY SIGNS

Well-designed signage informs visitors that biosecurity management within an apiary is important, and that there is a shared responsibility for maintaining it. The signs serve to alert people that they should register their presence before entering the apiary, as well as demonstrate a beekeeper's commitment to apiary hygiene and safety.

Biosecurity signs at entrances to a property or apiary should provide your name along with a contact phone number. In cases where hives are transported to different sites, signs should accompany hives and be placed at the new apiary site.

Biosecurity signs with contact information are also important when the apiary is situated on another property, so that the beekeeper may be contacted in the event of chemical spraying, a biosecurity incident (such as an exotic pest detection) or an emergency such as bushfires or flooding.

One template is for a 600 x 900 mm corflute panel with four eyelets to be placed on gates to properties or apiaries. The second is for an A4 corflute sign that can be staked at each apiary or moved around with each load of hives.

For more information about barrier management systems, QA programs or to download free templates for biosecurity signs, visit the BeeAware website *beeaware.org.au*

MOVEMENT OF HIVES, HONEY BEE PRODUCTS AND EQUIPMENT

MOVEMENT OF HIVES

The movement of hives for a honey flow or pollination contract can easily spread pests and diseases to other regions or apiary sites. Adopt the following management measures to reduce this risk.

- Minimise hive movements where feasible and understand the stress that is placed on honey bee colonies that are regularly moved.
- Ensure that hives, honey and apiary equipment are secured and covered during transport to prevent robbing by honey bees.
- When moving hives to a new location, survey the new location for disease threats such as abandoned or poorly managed hives.
- Always obtain a health certificate which has been signed by an apiary inspector from the state or territory of origin before moving hives interstate.
- Comply with relevant permit systems and border restrictions designed to slow the spread of Varroa mite.
- Find out which established pests are reportable for the region you are moving from, and to. If detected, contact the local department of agriculture (see contacts on page 32).

Keep accurate records of hive movements so that in the event of an incursion of an exotic pest or disease, trace back information about hive movements can be provided to identify possible risk areas for targeted surveillance.

Moving hives to a new apiary

MOVEMENT OF HONEY BEE PRODUCTS

Each state and territory has different restrictions on the interstate movement of honey and honey bee products such as wax, propolis and pollen. Before moving any of these products interstate, always contact the local department of agriculture for advice on any specific health certification requirements (see contacts on page 59).

MOVEMENT OF VEHICLES, MACHINERY AND EQUIPMENT

Vehicles and all apiary equipment, including forklifts, trucks, hand tools and bee boxes can carry pests and diseases in adhering honey and wax. Pests and diseases can then spread, or be introduced to a previously clean apiary.

Take the following measures to reduce the risk of pest and disease entry on equipment and vehicles:

- Clean and wash down vehicle trays of honey, wax and associated colony debris, especially after visiting other apiaries.
- Limit the movement of vehicles within the apiary.
- Always make sure that borrowed and second-hand apiary equipment and machinery is cleaned before moving into the apiary.
- Regularly clean and where appropriate sterilise all tools and equipment, including hive tools, gloves, pallets, boxes and any other equipment used in the apiary.

While inspecting and cleaning machinery can seem onerous, remember that it is easier and cheaper than dealing with a new pest or disease.

MOVEMENT OF VEHICLES AND APIARY EQUIPMENT BETWEEN PROPERTIES

As well as ensuring good honey bee hygiene, beekeepers who travel to farms or properties need to consider farm biosecurity for other primary producers or to the natural environment.

Pests, diseases and weeds carried in soil, apiary equipment, on vehicles, clothing and boots can introduce pests that are very damaging for other agricultural industries or to native vegetation.

- Always consider farm biosecurity when entering a property.
- Be aware of other industries' biosecurity risks and requirements.
- Adopt a 'come clean, go clean' policy wherever possible.
- Talk to the landholder about areas that have been visited or any specific biosecurity concerns that apply to their property.

For more information on farm biosecurity go to **farmbiosecurity.com.au**

BEEAWARE

BeeAware is a hub of online information for beekeepers and growers about honey bee biosecurity and pollination of agricultural and horticultural crops. The BeeAware website contains detailed information on established and exotic honey bee pests and diseases, the symptoms they cause and how to control them. It also has pollination information and advice on how growers and beekeepers can work together to get maximum benefit from honey bee pollination.

BeeAware contains the latest information for both hobby and commercial beekeepers about how to implement biosecurity best practice in the apiary, information on education and training resources, beekeeping associations and downloadable documents, such as this biosecurity manual.

The BeeAware website is funded by the Australian honey bee industry, pollinator-reliant industries, Plant Health Australia, governments and R&D agencies.

The BeeAware website is constantly being updated so become a frequent visitor to the site and see what is new.

HONEY BEE PESTS AND DISEASES

The BeeAware website contains extensive information and images about established pests in Australia as well as exotic pests that affect honey bee populations elsewhere in the world. Pest pages include:

ESTABLISHED PESTS	EXOTIC PESTS
Varroa mite *(V. destructor)*	Varroa mite *(e.g. V. jacobsoni)*
American foulbrood	Tropilaelaps mites
Small hive beetle	Tracheal mite
Asian honey bee	Asian hornet
European foulbrood	Africanised honey bee
Wax moth	Cape honey bee
Nosema	Large hive beetle
Sacbrood virus	Dwarf honey bee
Braula fly	Giant honey bee
Chalkbrood disease	Deformed wing virus
Black queen cell virus	

V. destructor exotic in most Australian states/territories.

Beekeepers need to be familiar with both established pests, their symptoms and how to control them, as well as exotic pests and how to monitor for them.

The life cycle and biology of each pest is described, as well as signs and symptoms to look for, guidance on how to check for them and how to manage the pests most commonly found in Australia. This includes links to other useful websites, fact sheets from Australia and around the world, and instructional videos.

POLLINATION

As honey bees forage for nectar and pollen they pollinate plants, resulting in benefits for many types of crops. The benefits vary from crop to crop, and include increased seed or fruit set, improved storage qualities and shape of some fruit, and a more synchronised maturation of some fruits or nuts.

The BeeAware website contains extensive information about the pollination requirements and the management practices that can be put in place to achieve optimal pollination for the following crops.

POLLINATOR RELIANT CROPS	
Almonds	Macadamias
Apples and pears	Melons
Avocados	Onions (for seed)
Berries	Papaya
Blueberries	Passionfruit
Cherries	Strawberries
Cotton	Summerfruit
Legumes and oilseeds	Vegetables
Lychees	

To assist farmers and beekeepers, BeeAware has details about how pollination works, checklists that beekeepers and growers should follow, and extensive information on the following topics:

- Pollination agreements – to clarify what a grower thinks they are hiring and what a beekeeper thinks they need to supply.
- Pesticides – which are harmful to bees, how to avoid being exposed to pesticides and how to report a bee kill incident.
- Preparing for Varroa – the impact that Varroa will have on pollination markets in Australia and how plant industries can prepare for an incursion.
- Native bees – outlines the role of native bees in Australia as pollinators and how these native populations can be promoted on-farm.

BIOSECURITY BEST PRACTICE CHECKLIST

This list of recommended biosecurity practices allows you to assess your honey bee management. While all practices may not be applicable, working through the list will highlight the strengths and weaknesses of an apiary. This ensures the apiary has the best protection against the introduction and spread of new pests and diseases.

Once identified, a few simple and practical procedures can be implemented to strengthen areas of greatest risk. While changing everyday practices can take more effort in the short term, these will become second nature with time and are easier and cheaper than dealing with the introduction of a new pest.

DATE OF BIOSECURITY CHECK:

Recommended Practices	Yes	No	Comments
PESTS			
You and your staff are familiar with common established and high priority exotic pests and diseases of honey bees			
Hives are regularly inspected for pests and diseases			
Alcohol wash, soapy water wash, sugar shaking or drone uncapping forms part of a routine health surveillance program to detect mites			
You and your staff know how and where to report pests and diseases			
Pest/disease surveillance activities and results are recorded even when nothing is found			
A science and evidence-based health program to monitor and manage pests/diseases is implemented			
You and your staff undertake biosecurity training to update knowledge			
APIARY AND PRODUCT MANAGEMENT			
Purchased queen bees and packaged bees are 'certified' or have a defined and documented health status			
Records of purchased queen bees and packaged bees, second hand hives with bees, used hive components and other used beekeeping equipment and their sources are maintained			
You and your staff are aware of symptoms of honey bee pests spread with queen bees, packaged bees, second hand hives with bees, used hive components and other used beekeeping equipment			
Brood and bees in purchased second hand working hives and used hive components are thoroughly checked within one month of arrival and for up to 12 months afterwards			
Honey and other products are loaded and unloaded on a paved or sealed pad away from production areas			
Waste material is disposed of away from production areas (preferably buried or burnt to keep it from foraging bees)			
Biosecurity and quality assurance schemes such as B-Qual or a barrier system are adopted			
Industry best management practices are adopted in the production of queen bees and packaged bees, honey and specialist products and in pollination services			
EQUIPMENT AND VEHICLES			
No honey, wax and colony debris is left on vehicles and apiary equipment in order to prevent robbing			
Wash down facilities are provided to clean vehicle trays of honey, wax and associated colony debris, especially after visiting other apiaries			
All tools and equipment, including hive tools, gloves, pallets, boxes and any other equipment used in the apiary are regularly cleaned and sterilised			
Discussions are regularly held with landholders about where you have travelled and the risk of spreading pests and/or disease onto their property that are significant for them or their industry			
Borrowed and second-hand machinery and equipment is cleaned and sterilised before use			

FURTHER INFORMATION

CONTACT THE ORGANISATIONS AND AGENCIES BELOW FOR MORE INFORMATION ON BIOSECURITY, APIARY HYGIENE, PESTS AND DISEASES AND THE AUSTRALIAN HONEY BEE INDUSTRY

Australian Honey Bee Industry Council

0402 467 780
ahbic@honeybee.org.au
www.honeybee.org.au

Plant Health Australia

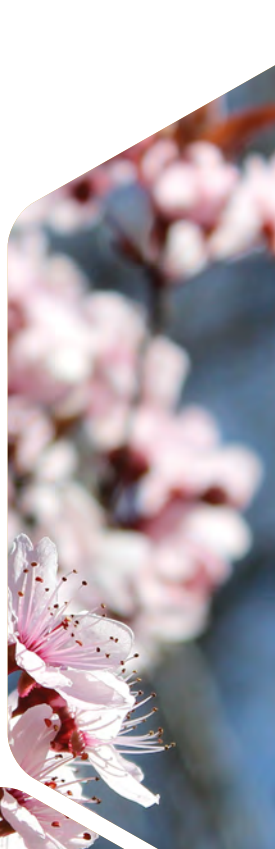
02 6215 7700
biosecurity@phau.com.au
www.phau.com.au

BeeAware

02 6215 7700
beeaware.org.au

farmbiosecurity

02 6215 7700
info@farmbiosecurity.com.au
www.farmbiosecurity.com.au

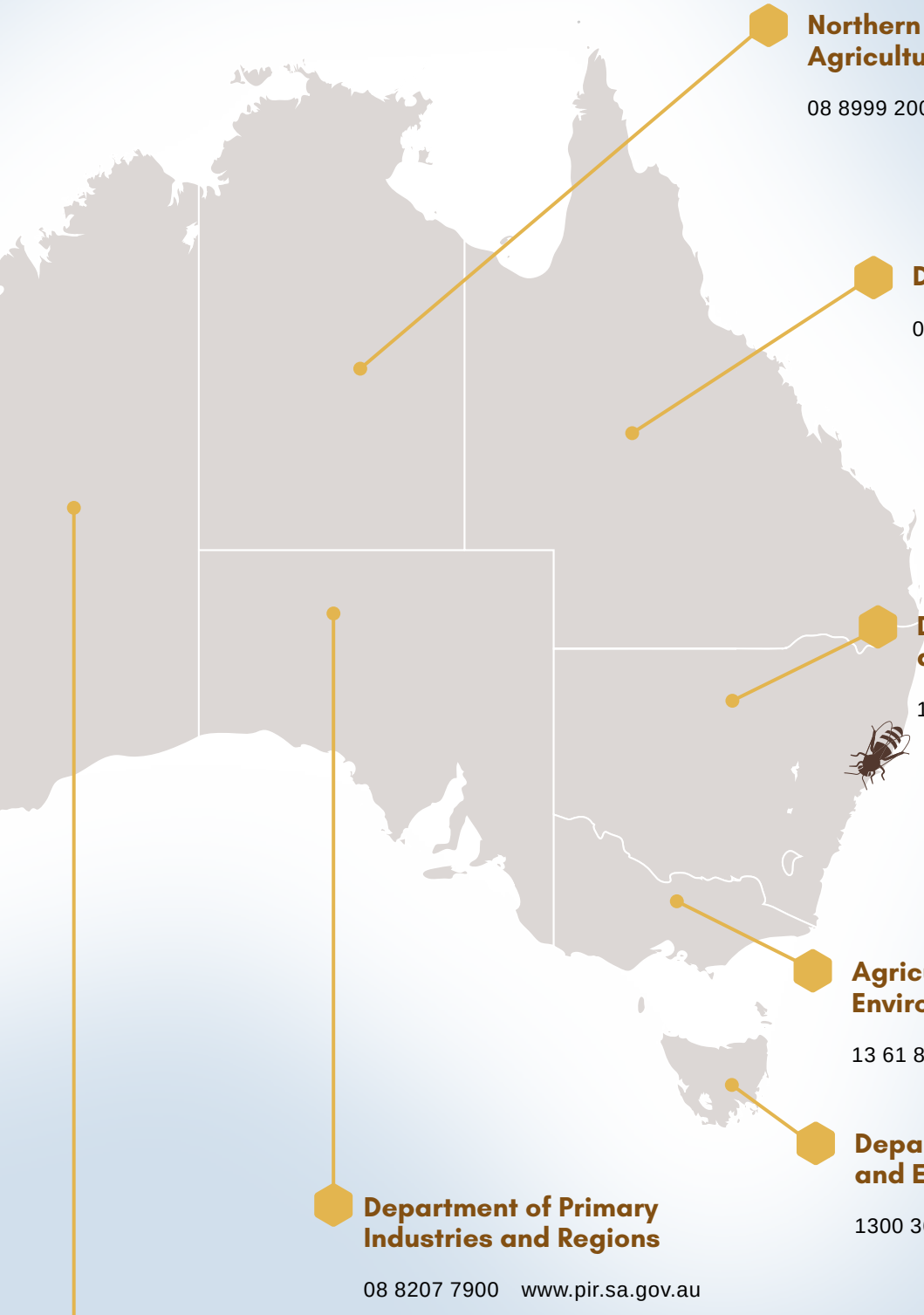


EXOTIC PLANT PEST HOTLINE
1800 084 881

AUSTRALIA

Department of Agriculture, Fisheries and Forestry

02 6272 3933 www.agriculture.gov.au



Northern Territory Department of Agriculture and Fisheries

08 8999 2006 www.industry.nt.gov.au

Department of Primary Industries

07 3404 6999 www.daf.qld.gov.au

Department of Primary Industries and Regional Development

1800 680 244 www.dpi.nsw.gov.au

Agriculture Victoria, Department of Environment, Energy, Climate Action

13 61 86 www.djpr.vic.gov.au

Department of Natural Resources and Environment

1300 368 550 www.nre.tas.gov.au

Department of Primary Industries and Regions

08 8207 7900 www.pir.sa.gov.au

Department of Primary Industries and Regional Development

1300 374 731 www.agric.wa.gov.au

PEST FACT SHEETS

FACT SHEET
VARROA MITES

ENDEMIC PEST

WHAT ARE VARROA MITES?

Varroa mites (*Varroa destructor* and *V. jacobsoni*) are external parasites of adult honey bees, and drone and worker bee brood. Varroa mites feed and reproduce on larvae and pupae, causing malformation and weakening of honey bees as well as transmitting numerous viruses. Heavy varroa mite infestations can build up quickly and cause scattered brood, crippled and crawling honey bees, a reduction in honey bee population, supersedure of queen bees and ultimate colony breakdown and death of the hive.

Varroa mites on honey bee pupa

Source: CSIRO

Varroa mite on forager worker bee

Source: Kathy Keatley Garvey, UC Davis Department of Entomology

WHAT DO THEY LOOK LIKE?

Adult female varroa mites are oval, flat, red-brown and around 1.1 mm long and 1.7 mm wide. They can be seen with the naked eye but are difficult to spot. Varroa mites complete their life cycle in honey bee brood and can be observed in both drone and worker bee brood. Examining the brood involves uncapping brood (preferably drone) to check for the dark mites in the cell and against the pearly white bodies of the developing brood. They can also be observed between the sclerites and between the head and thorax on adult worker bees and drones.

WHAT CAN THEY BE CONFUSED WITH?

Varroa mites could be confused with the braula fly (*Braula coeca*) which is red-brown, 1.5 mm long, covered in spine like hairs and has six long legs. Varroa mites could also be confused with pollen mites (*Mellitiphis alvearius*) which are light brown and are around 0.75 mm long and 0.75 mm wide. Pollen mites are not harmful to honey bees but are sometimes found in hives.

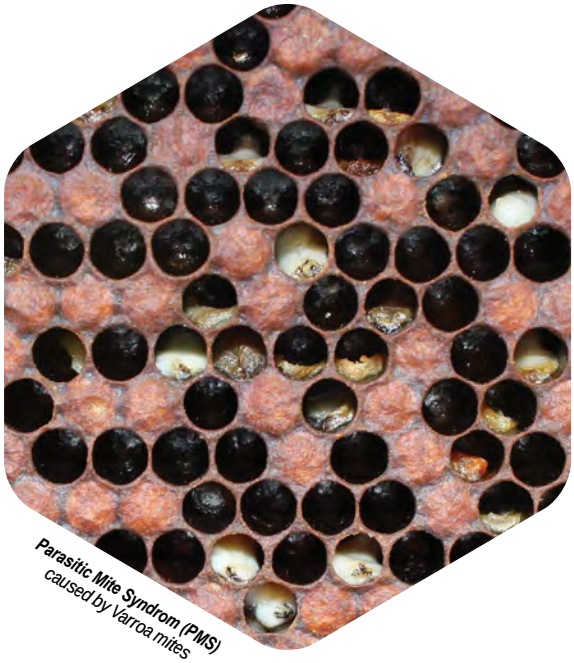
Varroa mites could also be confused with other exotic parasitic mites, most notably tropilaelaps mites (*Tropilaelaps clareae* and *T. mercedesae*).

Braula fly (top), Varroa mite (right), tropilaelaps mite (bottom) and Pollen mite (left)

Source: Food and Environment Research Agency (Fera), Crown Copyright

WHAT SHOULD BEEKEEPERS LOOK FOR?

Symptoms are dependent on the level of varroa mite infestation, the level of brood within the colony and the potential of viral infections transmitted by the varroa mites. Colonies with low infestation generally show very few symptoms. As varroa mite infestation grows, it results in the significantly reduced weight of worker bees and drones, impaired flight performance and a lower rate of return to the colony after foraging, a reduced lifespan as well as deformed wings and abdomens. Colony symptoms, commonly called parasitic mite syndrome (PMS), include a reduction in the adult honey bee population, loss of coordinated social behaviour, distorted and deformed honey bees, scattered brood with dead or uncapped brood and rapid honey bee de-population in the colony.



Source: Rob Snyder, www.beeinformed.org

Parasitic Mite Syndrom (PMS) caused by Varroa mites

Source: The Food and Environment Research Agency (Fera), Crown Copyright

Worker honey bee with severe wing deformities as a result of varroa infestation

HOW DO THEY SPREAD?

Varroa mites can spread through drifting drones and worker bees as well as through swarms and absconding colonies. The transport and movement of hives, used beekeeping equipment, packaged bees and queen bees are also effective means of spread.

For more information about varroa mites, go to *www.beeaware.org.au/varroa-mites*.
The BeeAware website contains extensive information on varroa mites, including:

- Life cycle
- Effect on bees
- Detection methods
- Spread and distribution
- Overseas experiences
- Additional fact sheets and videos

EXOTIC PEST

FACT SHEET
TRACHEAL MITE

WHAT IS TRACHEAL MITE?

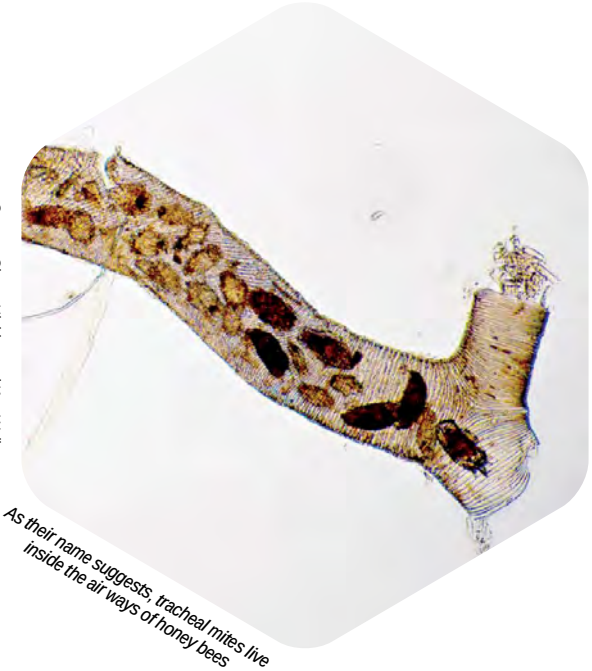
Tracheal mite (Acarapis woodi) is a microscopic, white coloured, internal mite of the honey bee respiratory system, capable of infecting queen bees, drones and worker bees. Tracheal mite infects and reproduces inside the tracheae (breathing tubes) of the honey bee and feeds on the honey bee's haemolymph (blood). Infection affects the honey bee's capacity to breathe, which results in weakened and sick honey bees which have a significantly reduced lifespan. If Tracheal mite infestation is combined with other stresses (disease, lack of pollen or nectar, etc.) it can lead to the death of the colony.

Source: Simon Hinkley and Ken Walker Museum Victoria, PADIL

Tracheal mites are microscopic and only visible by dissecting the bee's trachea

WHAT CAN IT BE CONFUSED WITH?

General symptoms associated with tracheal mite infestation such as population drop, honey bees staying in their hive and crawling and disoriented honey bees could be confused with other factors affecting honey bee colonies, such as a lack of pollen or nectar, pesticide use or various other pests and diseases.



Source: Simon Hinkley and Ken Walker Museum Victoria, PADIL

As their name suggests, tracheal mites live inside the air ways of honey bees

WHAT SHOULD BEEKEEPERS LOOK FOR?

Tracheal mites are invisible to the naked eye and there are no reliable or diagnostic visible symptoms of infestation. Tracheal mites spend their whole life inside adult honey bees, except for mature female tracheal mites, which have a mobile phase, and leave the host to attach to younger honey bees through bee to bee contact.

Despite this, serious tracheal mite infestation does cause general colony symptoms such as large numbers of crawling honey bees at the entrance of the hive which are unable to fly, honey bees appearing disorientated, honey bees holding their wings at odd angles ('K wing'), large numbers of honey bees staying in the hive rather than foraging and, in extreme cases, the hive population dropping dramatically. The only accurate diagnostic method for tracheal mite is laboratory examination of the honey bee's tracheae.

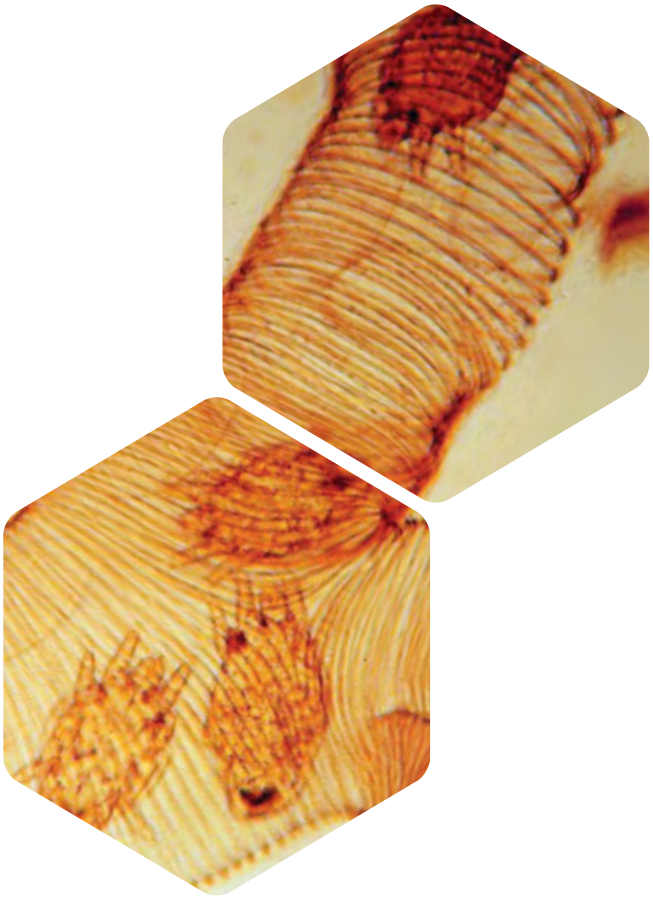
Honey bee colonies are more susceptible to tracheal mite in cooler climates and during autumn and winter. Tracheal mites can spread easily when a colony is in close proximity to each other, such as a winter cluster, and can contribute to heavy winter losses. Always be aware of any unusually high winter losses.

HOW DOES IT SPREAD?

Adult female tracheal mites are picked up by younger honey bees and are spread within the hive through bee to bee contact. Tracheal mites can also spread to new areas through the transportation of infected colonies and through swarming and absconding. Once in an area it can spread throughout an apiary through drone and worker bee drift between hives.

WHERE IS IT NOW?

Tracheal mite is not present in Australia but is found in most other honey producing regions of the world, such as Europe, North America and parts of Asia.



Honey bee showing signs of 'K wing'

Source: Long Lane Honey Bee Farms

HOW CAN BEEKEEPERS PROTECT THEIR HIVES FROM TRACHEAL MITE?

This pest is currently not present in Australia and there are strict quarantine requirements in place to protect the Australian honey bee industry.

If you observe any symptoms that you think may be caused by Tracheal mite, call the Exotic Plant Pest Hotline.

EXOTIC PLANT PEST HOTLINE
1800 084 881

For more information about tracheal mite, go to *www.beeaware.org.au/tracheal-mite*.
The BeeAware website contains extensive information on tracheal mites, including:

- Life cycle
- Symptoms
- Similar pests
- Spread and distribution
- Additional fact sheets and videos

EXOTIC PEST

FACT SHEET
TROPILAELAPS MITE

WHAT ARE TROPILAELAPS MITES?

Tropilaelaps mites are native to Asia and parasitise the brood of the giant honey bees of Asia. Two species of tropilaelaps mites (*Tropilaelaps clareae* and *T. mercedesae*) are also able to parasitise European honey bees (*Apis mellifera*) and reproduce on their brood. If tropilaelaps mites were to become established in Australia, they would cause significant losses to managed and feral honey bee colonies.

Source: Ken Walker Museum Victoria, PADIL

Tropilaelaps mites are longer than they are wide

Source: Denis Anderson, CSIRO

Tropilaelaps mites on European honey bee pupae, and a deformed honey bee resulting from tropilaelaps mite infestation

WHAT DO THEY LOOK LIKE?

Tropilaelaps mites are active, red-brown mites which are around 1 mm long and 0.5-1 mm wide. They can be seen with the naked eye on both adult honey bees or in the brood. Adult tropilaelaps mites lay eggs in the brood cells of honey bee larvae and feed on developing honey bees.

Infestation results in the transmission of honey bee viruses and causes the death of many pupae, resulting in an irregular brood, deformed honey bees with missing legs or wings and ultimately colony decline or absconding. Crawling honey bees and brood discarded at the entrance of a colony may indicate a colony heavily infested with tropilaelaps mites.

WHAT CAN THEY BE CONFUSED WITH?

Tropilaelaps mites could be confused with the braula fly (*Braula coeca*) which is red-brown, 1.5 mm long, covered in spine like hairs and has six long legs.

Tropilaelaps could also be confused with pollen mites (*Mellitiphis alvearius*) which are light brown and are around 0.75 mm long and 0.75 mm wide. Pollen mites are not harmful to honey bees but are sometimes found in hives. Tropilaelaps mites could also be confused with varroa mites (*Varroa destructor* and *V. jacobsoni*).

Source: Food and Environment Research Agency (Fera), Crown Copyright

Braula fly (top), Varroa mite (right), Tropilaelaps mite (bottom) and Pollen mite (left)

WHAT SHOULD BEEKEEPERS LOOK FOR?

Observing tropilaelaps mites on adult honey bees is difficult because only 3-4% of adult tropilaelaps mites attach themselves to adult honey bees. When adult tropilaelaps mites emerge from a brood cell, they almost immediately enter another brood cell within 24 hours, which makes it unlikely that they will be noticed until the level of infestation is quite high. As tropilaelaps mite infestation grows, honey bees will develop symptoms such as stunted wings, missing legs, shrunken thoraces and other deformities. Nurse bees may also start removing infested brood and deformed honey bees and deposit them at the hive entrance.

HOW DO THEY SPREAD?

Tropilaelaps mites can spread through the transportation of infested hives and adult honey bee drift. However, unlike varroa mites which can potentially survive on adult honey bees for months, tropilaelaps mites can only survive on adult honey bees for up to three days. Therefore, the level of tropilaelaps mite spread is dependent on the level of brood within colonies.

Source: Denis Anderson, www.beesdownunder.com.au

Tropilaelaps mite feeding on a giant honey bee, Apis dorsata, pupa

Source: Food and Environment Research Agency (Fera), Crown Copyright

Deformed pupae are a sign of tropilaelaps mites

WHERE ARE THEY NOW?

Tropilaelaps clareae is currently only present in the Philippines, while *Tropilaelaps mercedesae* is present throughout regions of mainland Asia, including Papua New Guinea.

HOW CAN BEEKEEPERS PROTECT THEIR HIVES FROM TROPILAELAPS MITES?

This pest is currently not present in Australia and there are strict quarantine requirements in place to protect the Australian honey bee industry.

If you see any of these symptoms, or observe mites on your honey bees or in the brood, call the Exotic Plant Pest Hotline.

EXOTIC PLANT PEST HOTLINE
1800 084 881

For more information about tropilaelaps mites, go to *www.beeaware.org.au/tropilaelaps*.
The BeeAware website contains extensive information on tropilaelaps mites, including:

- Life cycle
- Appearance
- Detection methods
- Spread and distribution
- Similar pests
- Additional fact sheets and videos

FACT SHEET
AMERICAN FOULBROOD

ESTABLISHED PEST

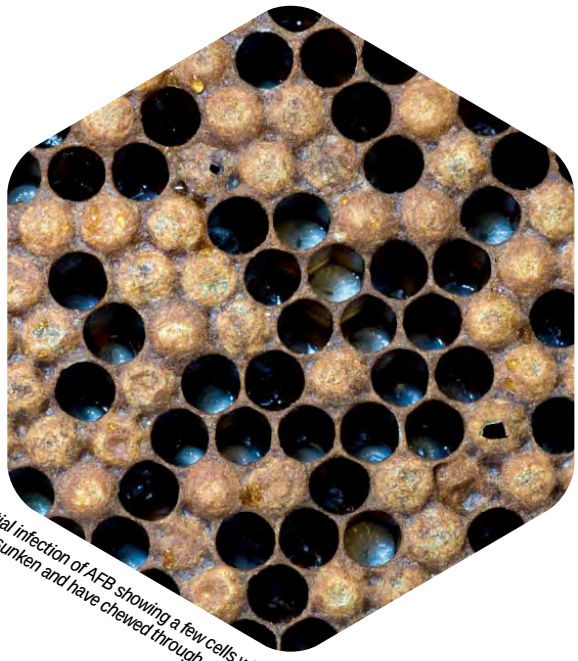
WHAT IS AMERICAN FOULBROOD?

American foulbrood (AFB) is a fatal microbial disease of honey bee brood caused by the spore forming bacterium *Paenibacillus larvae*. The disease is caused when young larvae ingest spores of the bacterium which germinate in the honey bee's gut. The brood usually dies at the pre-pupal or pupal stage.

WHAT SHOULD BEEKEEPERS LOOK FOR?

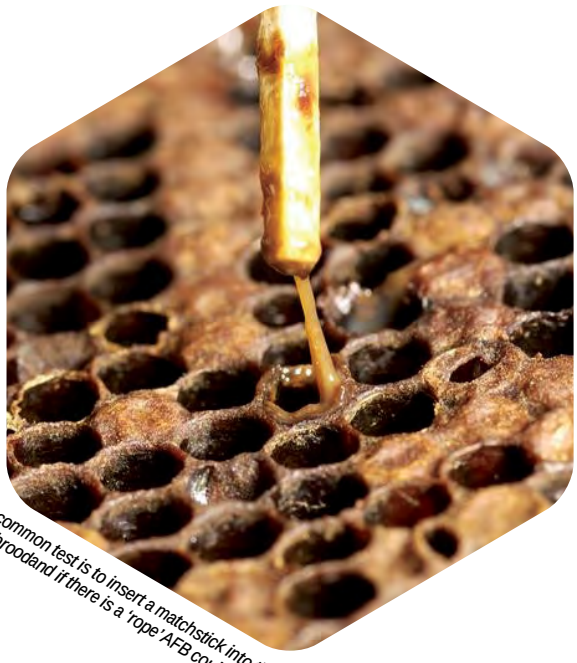
Brood combs should be thoroughly examined for AFB at least twice a year, preferably in spring and in autumn, although AFB can occur in hives at any time of the year. Beekeepers should remove each brood frame from the colony and look for symptoms such as sunken, darkened and greasy looking, perforated cappings and irregular brood pattern in advanced infections. Look closely, as early infections may only have as few as one or two cells showing disease signs.

Brood infected with AFB generally die after the cells are capped and the affected brood becomes discoloured, changing from the healthy pearly white to a darker brown as the disease progresses. At this stage of infection beekeepers should conduct the ropiness test. Thrust a matchstick into the infected individual in the cell and if the semi-fluid remains are drawn out in a ropy thread it indicates the hive could be infected with AFB. After about a month, infected brood dry to a dark scale which adheres to the wall of the cell.



Initial infection of AFB showing a few cells which are sunken and have chewed through cappings

Source: Doug Somerville, NSW DPI



A common test is to insert a matchstick into the dead broodand if there is a 'rope' AFB could present

Source: Food and Environment Research Agency (Fera), Crown Copyright

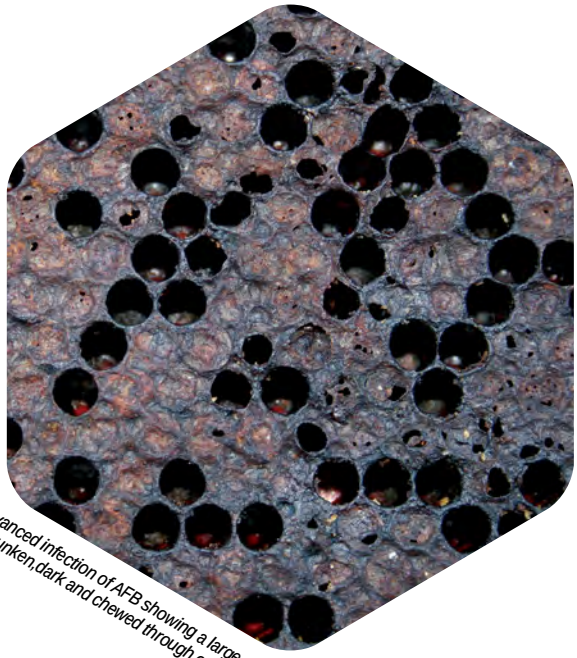
WHAT CAN THEY BE CONFUSED WITH?

AFB can be confused with European foulbrood (EFB). The majority of EFB infected larvae die before capping and appear coiled in their cells, unlike AFB where the majority of infected larvae die after capping. However, when EFB infected brood die at older stages they can be confused with AFB.

Another potential difference between AFB and EFB is that when the ropiness test is conducted, by placing a matchstick into the affected brood, AFB infected brood could be drawn out in a longer ropy thread than EFB infected brood. However, when *Paenibacillus alvei* (a common secondary invader in EFB) is present it may also cause some extra ropiness which makes EFB infected brood resemble AFB infected brood. Laboratory diagnosis is the only accurate means to differentiate AFB from EFB.

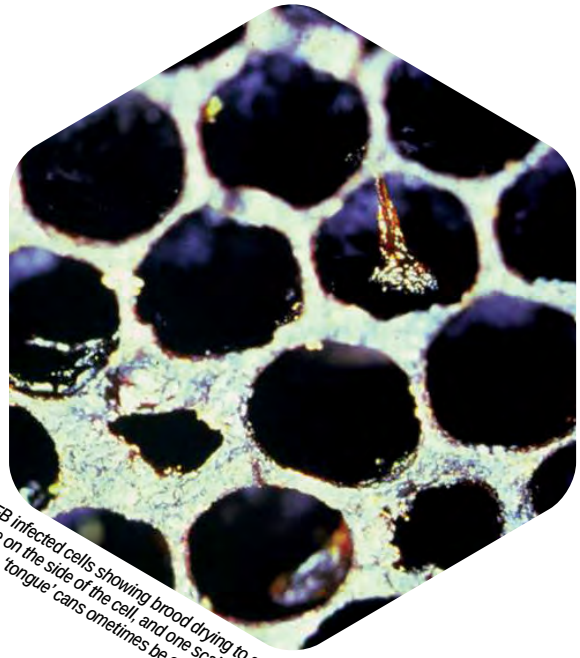
HOW DOES IT SPREAD?

The main methods of AFB spread are through the interchange of infected combs and hive components, by feeding colonies infected honey or pollen, by honey bees robbing honey from infected hives or from extraction sites, as well as by honey bees drifting from infected colonies into neighbouring colonies. The spores of the bacterium are very infectious to larvae less than 24 hours old and can remain dormant for over 50 years.



Doug Somerville, NSW DPI/Doug Somerville, NSW DPI

Advanced infection of AFB showing a large area of sunken,dark and chewed through cappings

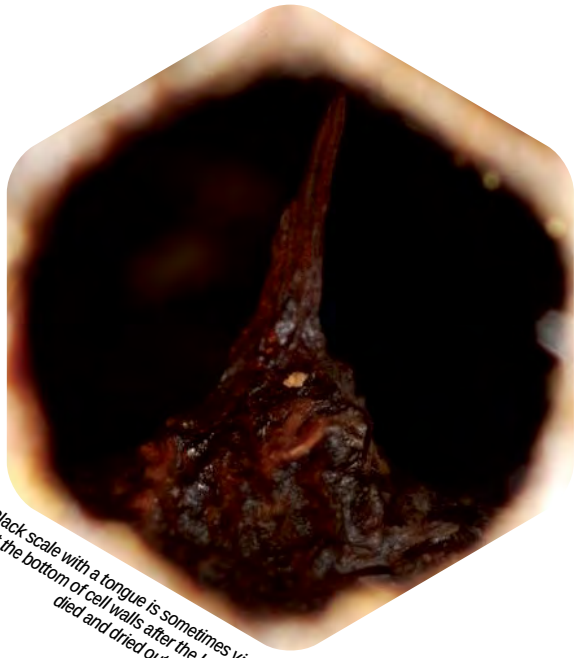


Source: Doug Somerville, NSW DPI

AFB infected cells showing brood dying to a dark scale on the side of the cell, and one scale having a 'tongue' cans ometimes be observed

WHERE IS IT NOW?

AFB is present throughout Australia; however, it has not been reported or confirmed in the NT, or Kangaroo Island (SA).



Source: Food and Environment Research Agency (Fera), Crown Copyright

Black scale with a tongue is sometimes visible at the bottom of cell walls after the larva has died and dried out

HOW CAN BEEKEEPERS PROTECT THEIR HIVES FROM AMERICAN FOULBROOD?

Beekeepers should always check brood combs at least twice a year for early signs of AFB. Brood combs should be replaced every 3 years as old brood combs can act as a reservoir of the bacterium. To greatly minimise the spread of AFB throughout hives, beekeepers should put in place a barrier management system and clean hive tools and apiary equipment between hives and apiaries.

If AFB is found in a hive, thoroughly clean all hive tools, gloves and apiary equipment before inspecting other hives or another apiary. When AFB is detected, contact your local department of agriculture, kill the infected colony and either irradiate or burn infected hive parts in a pit and cover the remains.

For more information about AFB, go to *www.beeaware.org.au/american-foulbrood*.
The BeeAware website contains extensive information on AFB, including:

- Disease cycle
- Symptoms
- Detection methods
- Similar pests
- Spread and distribution
- Management options
- Additional fact sheets and videos

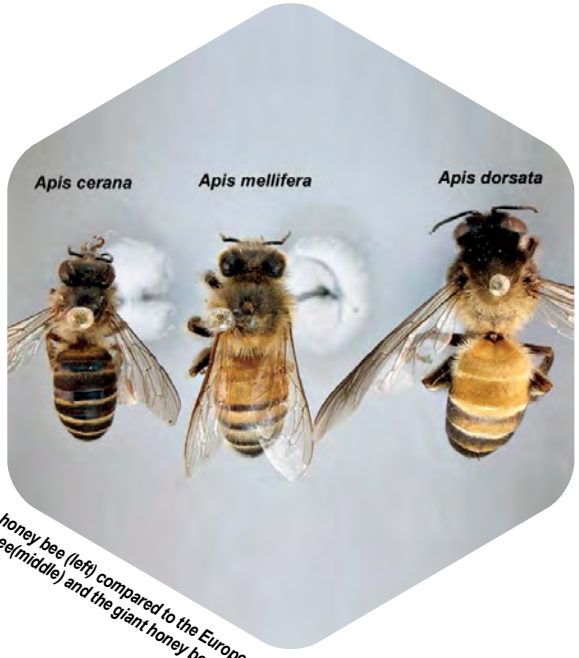
ESTABLISHED PEST

FACT SHEET

ASIAN HONEY BEE *(JAVA GENOTYPE)*

WHAT IS THE ASIAN HONEY BEE?

The Asian honey bee (AHB), *Apis cerana*, is found throughout the tropical, sub-tropical and temperate zones of south-east and mainland Asia. This wide distribution has led to variations, commonly known as genotypes or strains, particularly between the temperate and tropical AHB.



Source: Ken Walker Museum Victoria, PADIL

Asian honey bee (left) compared to the European honey bee(middle) and the giant honey bee (right)

Source: Denis Anderson, CSIRO

AHB worker bees

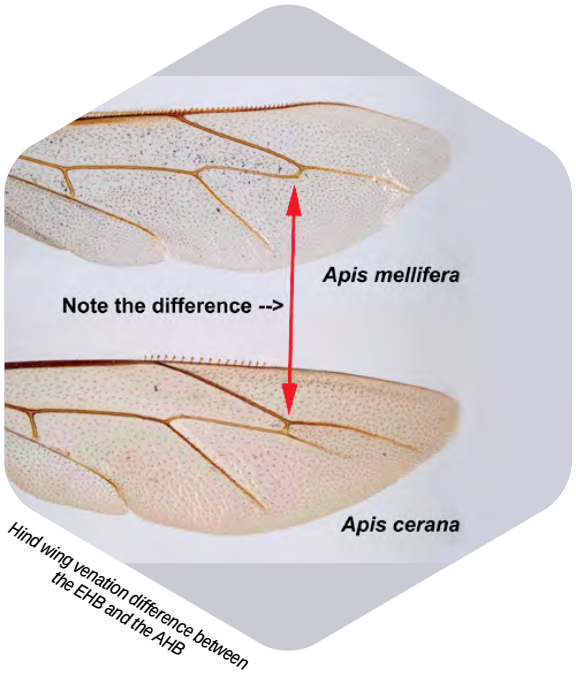
Although there are numerous strains or genotypes of *Apis cerana*, this fact sheet will specifically focus on the AHB that is present in Cairns (Queensland). The AHB found throughout the Cairns region of Queensland is *Apis cerana* Java genotype. This genotype cannot be managed for honey production and pollination services due to its frequent swarming and tendency to abscond. The AHB produces less honey than the European honey bee (EHB), *Apis mellifera*, and also commonly robs the EHB of their honey stores. It also has the potential to become a major competitor for nectar, pollen and nesting sites in the natural environment.

WHAT DOES IT LOOK LIKE?

The AHB is approximately 10 mm long and looks like a slightly smaller version of the EHB.

WHAT CAN IT BE CONFUSED WITH?

The AHB could be confused with the EHB, which is present throughout Australia in both managed and feral honey bee colonies. However, the AHB is slightly smaller, has a darker abdomen, is slightly less hairy and has a more erratic flying pattern than the EHB. The AHB also differs to the EHB by having a distal abscissa of vein M in the hind wing, as well as its drone brood containing pin hole sized pores on the top of the cell, which become prominent within a week of hatching from the cell.



Source: Ken Walker Museum Victoria, PADIL

Hind wing venation difference between the EHB and the AHB

WHAT SHOULD BEEKEEPERS LOOK FOR?

Beekeepers should look for AHB nests and swarms. The AHB is a cavity nesting honey bee and therefore prefers enclosed openings such as tree hollows. The AHB can also swarm and nest in urban and disturbed environments. In Cairns (Queensland), the AHB has been found in cavities such as letterboxes, walls of buildings, compost bins and on machinery. AHB nest and swarm sizes can range anywhere from 200 –10,000 honey bees.

HOW DOES IT SPREAD?

The AHB can spread naturally through swarming and absconding. AHB colonies can produce up to 10 swarms per year and have been reported to travel up to 10 km from the original colony, but most commonly swarm only 1-2 km from the original colony. Reproduction, nest disturbances, pest and disease pressure or even a lack of nectar or pollen can cause the AHB to swarm or abscond.

The AHB is a proven hitchhiker on a variety of modes of transport and can spread over large distances into new areas on boats, trains, trucks and on shipping cargo.

AHB swarm in a letterbox

Source: Queensland Department of Agriculture and Fisheries

AHB drone brood with pin hole sized openings

Source: Ben Oldroyd, University of Sydney

WHERE IS IT NOW?

The AHB originated in Java (Indonesia) and has since spread throughout Irian Jaya, Papua New Guinea and the Solomon Islands. In 2007 the AHB was detected in the Cairns region of Queensland and has since been found westwards to Julatten, south to South Johnstone and north to Mossman. It has not been found outside this region in Australia.

HOW CAN BEEKEEPERS PROTECT THEIR HIVES FROM THE ASIAN HONEY BEE?

Currently, the only method of control is to find the AHB nest and destroy it. If you find, or think you have found the AHB it should be reported to your local department of agriculture immediately.

For more information about AHB, go to *www.beeaware.org.au/asian-honey-bee*.
The BeeAware website contains extensive information on AHB, including:

- Appearance
- Detection
- Management options
- Spread and distribution
- Additional fact sheets and videos

ESTABLISHED PEST

FACT SHEET

BLACK QUEEN CELL VIRUS

WHAT IS BLACK QUEEN CELL VIRUS?

Black queen cell virus (BQCV) is caused by the Black queen cell virus (*Cripavirus*). BQCV causes mortality in queen bee pupae, with dead queen bee larvae turning yellow and then brown black. The disease is most common in spring and early summer. It is believed that infection with BQCV may be transmitted by *Nosema apis*, a microsporidian parasite of the honey bee that invades the gut of adult honey bees.

Worker bees on a queen bee cell

Source: Food and Environment Research Agency (Fera), Crown Copyright

Queen cell infected with BQCV

Source: Rob Snyder, www.beeinformed.org

WHAT SHOULD BEEKEEPERS LOOK FOR?

Infection with BQCV causes queen bee pupae to turn yellow and the skin of the pupae to become sac-like. At latter stages of infection, the dead queen bee may change to brown-black. The walls of the queen bee cell also become a darker, brown-black colour. BQCV is often associated with *Nosema apis* infection. If nosema disease is present within a queen bee breeding operation, it is always useful to look for signs of BQCV on a regular basis.

WHAT CAN IT BE CONFUSED WITH?

BQCV can potentially be confused with sacbrood virus as the pupae show the same symptoms of yellow colouration, the skin becoming plastic-like and the dead pupa becoming a fluid filled sac. However, as its name suggests, BQCV usually affects queen bee pupae, while sacbrood virus mainly affects developing worker bee larvae.

Sacbrood disease affect larvae. BQCV causes the queen bee pupae to sometimes display similar symptoms

Source: Food and Environment Research Agency (Fera), Crown Copyright

HOW DOES IT SPREAD?

BQCV is thought to be transmitted by nurse bees when they feed larvae infected brood food. The virus may remain viable in larval remains, honey or pollen for up to four weeks. *Nosema apis* infection in a colony may be another transmission route of BQCV. Honey bees drifting between hives, contaminated water and equipment can also spread BQCV.

WHERE IS IT NOW?

BQCV is present throughout Australia; however, it has not been reported or confirmed in the NT.

When breeding queen bees, look for signs of BQCV in queenbee cell starters

Source: Sam Malfroy

Queen bee cages

Source: Sam Malfroy

HOW CAN BEEKEEPERS PROTECT THEIR HIVES FROM BLACK QUEEN CELL VIRUS?

BQCV is usually able to be controlled in most colonies with appropriate nutrition, young queen bees with populous hives, comb rotation every 3 years and the placement of hives in a warm and sunny position over the autumn, winter and spring periods. This will help keep colonies strong, remove extra stresses and also reduce the potential of nosema disease infection.

Beekeepers should maintain good apiary hygiene and be aware of the symptoms of BQCV or nosema infection within any queen bee breeding operation. If a beekeeper is a queen bee breeder and believes cell starters or nucleus hives are infected with BQCV, they should not be used for raising queen bees, or sold or distributed. This will help stop the spread of infected queen bees to other hives and regions.

If BQCV is detected in a queen bee breeding operation, it is recommended that the beekeeper contact their local department of agriculture and request to send in a sample for laboratory diagnosis.

For more information about BQCV, go to *www.beeaware.org.au/black-queen-cell- virus*.
The BeeAware website contains extensive information on BQCV, including:

- Appearance
- Similar pests
- Management options
- Spread and distribution
- Additional fact sheets

ESTABLISHED PEST

FACT SHEET
BRAULA FLY

WHAT IS A BRAULA FLY?

The braula fly lives in honey bee colonies and attaches itself to honey bees where it feeds on nectar and pollen at the honey bee's mouth and on material secreted by the host. The pest is not considered a serious threat to commercial beekeeping as it does not damage or parasitise any stage of the honey bee life cycle. However, its presence may reduce the egg laying capacity of queen bees and could potentially make the detection of external parasitic mites difficult.

Source: Simon Hinkley and Ken Walker Museum Victoria, PADIL

Braula fly is small and wingless

Source: Food and Environment Research Agency (Fera), Crown Copyright

Braula fly (top), varroa mite (right), tropilaelaps mite (bottom) and pollen mite (left)

WHAT DOES IT LOOK LIKE?

The braula fly is a small (0.9 mm wide by 1.5 mm long) wingless fly. It is red-brown, covered in hairs and has six legs. The braula fly lay small eggs (0.84 mm by 0.42 mm) throughout the hive, however, only the eggs deposited on capped honey comb will hatch. The hatched larvae tunnel under the cappings leaving narrow tracks about 1 mm wide across the surface of the comb. This tunnelling gives the comb a fractured appearance, a key characteristic of braula fly presence.

WHAT CAN IT BE CONFUSED WITH?

Braula fly could be confused with the parasitic varroa mites and tropilaelaps mites. Adult female varroa mites are oval, flat, red-brown, and 1 mm long and 1.7 mm wide. tropilaelaps mites are active, red-brown mites which are around 1 mm long and 0.5-1 mm wide.

Braula fly could also be confused with pollen mites (*Mellitiphis alvearius*) which are light brown and around 0.75 mm long and 0.75 mm wide. Pollen mites are not harmful to honey bees but are sometimes found in hives. If any mites are observed on adult honey bees or in the brood, call the Exotic Plant Pest Hotline immediately on 1800 084 881.

Source: The Food and Environment Research Agency (Fera), Crown Copyright

An outline of the braula fly on a finger, note the 6 prominent legs

WHAT SHOULD BEEKEEPERS LOOK FOR?

Braula fly have a preference to attach to queen bees, but have also been observed on drones and worker bees as well. As a result of this preference, queen bees should be thoroughly and regularly checked. Beekeepers should also look through harvested comb honey, as braula fly larvae can tunnel through honey cappings, damaging the appearance and marketability of any comb honey produced.

HOW DOES IT SPREAD?

Braula fly can spread through swarming or absconding honey bee colonies and drifting honey bees. Braula fly can also spread through the interchange of hive components from apiary to apiary, as well as the movement of hives. The larvae can also be spread by the removal and transport of infected comb honey.

Source: Lindsay Bourke

Numerous braula fly on the thorax of a queen bee

Source: Lindsay Bourke

Fractured appearance of honey comb from burrowing braula fly larvae

WHERE IS IT NOW?

Braula fly is in Tasmania.

HOW CAN BEEKEEPERS PROTECT THEIR HIVES FROM BRAULA FLY?

Braula fly has not been shown to cause a weakening of honey bee colonies. However, beekeepers specialising in comb honey production may need to consider control measures if the braula fly becomes a problem during peak production periods. Control measures include freezing (-15°C) comb honey for at least 24 hours which will kill all life stages of the braula fly. The normal practice of extracting honey is another effective means to control the larval stage of the braula fly.

For more information about braula fly, go to *www.beeaware.org.au/braula-fly*.
The BeeAware website contains extensive information on braula fly, including:

- Life cycle
- Appearance
- Detection methods
- Similar pests
- Spread and distribution
- Management options
- Additional fact sheets and videos

ESTABLISHED PEST

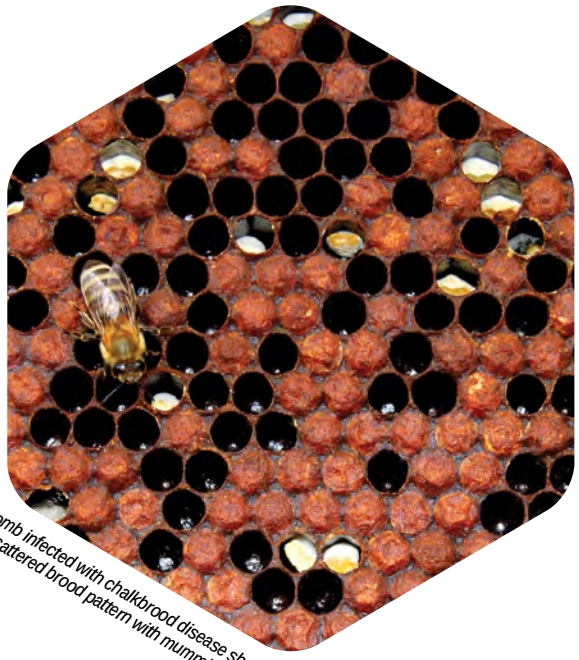
FACT SHEET
CHALKBROOD DISEASE

WHAT IS CHALKBROOD DISEASE?

Chalkbrood disease is caused by the fungus *Ascosphaera apis*. The fungus produces spores which are swallowed by honey bee larvae when they are fed by nurse bees. The spores germinate in the honey bee's gut and ultimately cause the larvae to die of starvation. Chalkbrood is present throughout Australia and its incidence is generally higher when the colony is under stress due to cool wet weather or poor nutrition. It is more common in the spring when the brood nest is rapidly expanding and a smaller adult workforce cannot maintain brood nest temperature.

Source: Rob Snyder, www.beeinformed.org

The chalkbrood fungus starting to envelop a developing pupa



Source: Rob Snyder, www.beeinformed.org

Comb infected with chalkbrood disease showing a scattered brood pattern with mummies in cells

WHAT SHOULD BEEKEEPERS LOOK FOR?

Infected hives show a scattered brood pattern with perforated cappings. Larvae infected with chalkbrood disease usually die after capping and the fungus grows to fill the cell. The larval body dehydrates creating diagnostic 'mummies' – hard, shrunken and chalklike. The fungal mycelium infiltrates the larval tissue and fruiting gives the mummies a white-grey colour.

The cappings of cells containing dead larvae may be chewed away by the honey bees and the mummies removed to the hive entrance, dropped to the bottom board, or on the ground outside the hive.

WHAT CAN IT BE CONFUSED WITH?

Chalkbrood disease symptoms of scattered brood with perforated cappings could be confused with either American foulbrood (AFB), European foulbrood (EFB) or sacbrood virus. However, the presence of mummies in the cells, the hive entrance and bottom boards, together with no ropy thread when conducting the ropiness test, would suggest chalkbrood disease is the cause.

Source: Food and Environment Research Agency (Fera), Crown Copyright

Dead larvae in cells that have turned white due to fungal growth

HOW DOES IT SPREAD?

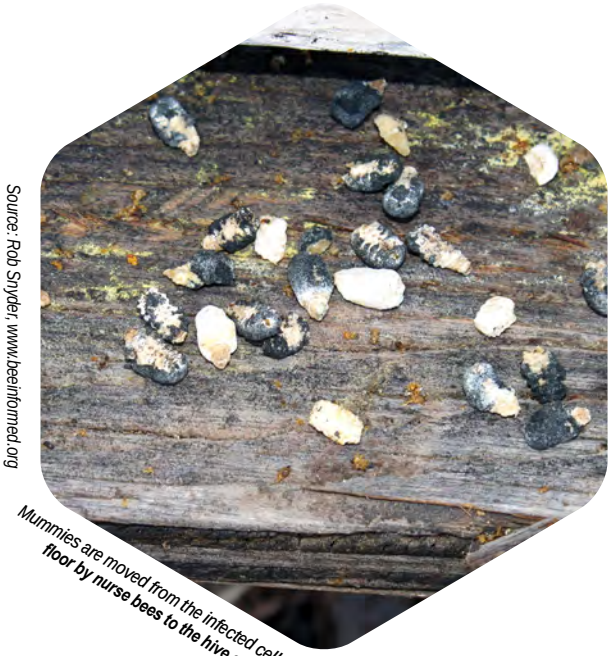
Chalkbrood disease can be easily spread between hives through the drifting behaviour of drones and worker bees, as well as the robbing behaviour of worker bees. Once inside a hive, fungal spores are quickly spread throughout the hive from mummies. It can also be transferred between apiaries on contaminated equipment, pollen and in water. The chalkbrood spores may remain viable for 15 years.

WHERE IS IT NOW?

Chalkbrood disease is present throughout Australia; however, it has not been reported or confirmed in the NT.

Source: Food and Environment Research Agency (Fera), Crown Copyright

Mummies on the hive floor



Source: Rob Snyder, www.beeinformed.org

Mummies are moved from the infected cells or hive floor by nurse bees to the hive entrance

HOW CAN BEEKEEPERS PROTECT THEIR HIVES FROM CHALKBROOD DISEASE?

Beekeepers should replace diseased combs which can act as a reservoir for chalkbrood disease spores, as well as cleaning away mummified larvae from the bottom boards and around the entrance of the hive. These activities will remove the main source of infection within a hive, and assist in preventing reinfection of the disease. Hives should also be placed in a well-ventilated, dry area with the sun facing the entrance of the hive to reduce conditions that favour the disease.

Honey bee stocks differ in susceptibility to chalkbrood disease, so beekeepers should replace the infected colony's queen bee with one supplied by a reputable breeder. This variation in susceptibility is mainly due to differences in the hygienic ability of the honey bees to uncap and remove diseased brood. By selecting queen bees or obtaining honey bees from hives that show this trait, the effects of chalkbrood disease can be reduced.

For more information about chalkbrood, go to *www.beeaware.org.au/chalkbrood*.
The BeeAware website contains extensive information on chalkbrood, including:

- Life cycle
- Appearance
- Similar pests
- Spread and distribution
- Management options
- Additional fact sheets

ESTABLISHED PEST

FACT SHEET
EUROPEAN FOULBROOD

WHAT IS EUROPEAN FOULBROOD?

European foulbrood (EFB) is a brood disease caused by the bacterium *Melissococcus plutonius*. Larvae of all ages are susceptible to infection and become infected after ingesting contaminated food. The bacterium then multiples in the gut of the larvae and competes for food, resulting in the larvae dying of starvation. The incidence of EFB is generally higher when the colony is under stress such as in spring, when the weather can be cool and wet or when nutrition is poor.

Source: Food and Environment Research Agency (Fera), Crown Copyright

Spotted brood pattern is an indicator of EFB

Source: Rob Snyder, www.beeinformed.org

Central cells are infected with EFB and are curled upwards and off coloured

WHAT SHOULD BEEKEEPERS LOOK FOR?

Brood combs should be thoroughly examined for EFB in spring and in autumn. Beekeepers should remove each brood frame from the hive and look for symptoms such as an irregular brood pattern with a mottled appearance. Infected larvae die in a coiled or twisted position, and change from the healthy pearly white to yellow and then to brown. Beekeepers should specifically look at unsealed brood because most infected larvae usually die before their cells are capped.

At this stage of infection beekeepers should conduct the ropiness test on older dead brood. Thrust a matchstick into the infected individual, and if the semi-fluid remains are drawn out in a ropy thread it indicates the hive could be infected with EFB. In older dead brood, a strong ammonia-like smell may also be present.

Source: Doug Somerville, NSW DPI

Infection of EFB in its early stages showing infected larvae turning yellow

WHAT CAN IT BE CONFUSED WITH?

EFB can be confused with American foulbrood (AFB). The majority of EFB infected larvae die before capping and appear coiled in their cells, which is in contrast to AFB where the majority of infected larvae die after capping. However, when EFB infected brood die at older stages they can be confused with AFB.

Another potential difference between AFB and EFB is that when the ropiness test is conducted by placing a matchstick into the affected brood, AFB infected brood is usually drawn out in a longer ropy thread than EFB infected brood. However, when *Paenibacillus alvei* (a common secondary invader in EFB) is present it may also cause some extra ropiness which makes it resemble AFB infected brood. Laboratory diagnosis is the only accurate means to differentiate EFB from AFB.

HOW DOES IT SPREAD?

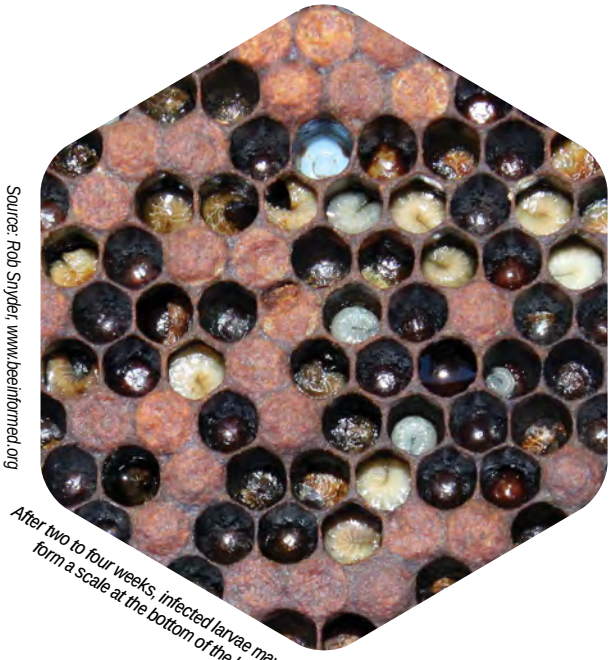
EFB can be spread within an apiary and between apiaries by the interchange of infected combs and hive components, feeding hives infected honey or pollen, honey bees robbing honey from infected hives or from extraction sites, as well as by honey bees drifting from infected colonies into neighbouring colonies. EFB is highly infectious and can remain viable for several years.

WHERE IS IT NOW?

EFB is present in all states and territories in Australia, except for WA and NT.

Source: Rob Snyder, www.beeinformed.org

Healthy larvae are pearly white, while EFB infected larvae are a darker, yellowish colour and are in a coiled and twisted position



Source: Rob Snyder, www.beeinformed.org

After two to four weeks, infected larvae may dry up to form a scale at the bottom of the brood cell

HOW CAN BEEKEPERS PROTECT THEIR HIVES FROM EUROPEAN FOULBROOD?

Beekeepers should always try to keep strong colonies with a young and healthy queen bee, as well as replacing brood combs every 3-4 years as these can act as a reservoir for the bacterium. Brood combs should be thoroughly checked for early signs of EFB in spring and autumn. To greatly minimise the spread of undetectable levels of EFB throughout loads of hives, put in place a barrier management system and disinfect hive tools and apiary equipment between hives and apiaries.

For more information about EFB, go to *www.beeaware.org.au/european-foulbrood*.
The BeeAware website contains extensive information on EFB, including:

- Disease cycle
- Symptoms
- Similar pests
- Detection methods
- Spread and distribution
- Management options
- Additional fact sheets

ESTABLISHED PEST

FACT SHEET

GREATER AND LESSER WAX MOTH

WHAT ARE WAX MOTHS?

There are two species of wax moth, the greater wax moth (*Galleria mellonella*), and the lesser wax moth (*Achroia grisella*). Both species are pests of active hives, however they most commonly cause damage to unattended combs in storage, especially in areas that are dark, warm and poorly ventilated. Both species will eat beeswax, particularly unprocessed wax, pollen, remains of larval honey bees, honey bee cocoon silk and enclosed honey bee faeces found on walls of brood cells.

Source: Simon Hinkley and Ken Walker Museum Victoria, PADIL

Lesser wax moth: note wings are spread for identification purposes, they would usually be closed over body

Source: Simon Hinkley and Ken Walker Museum Victoria, PADIL

Greater wax moth: note wings are spread for identification purposes, they would usually be closed over body

WHAT DO THEY LOOK LIKE?

The greater wax moth is a small grey coloured moth with some mottling on its wings and about 13-19 mm long. The lesser wax moth has similar colouration but is only 10-13 mm long.

Eggs are laid by the adult wax moths in dark cracks and crevices around the hive or in unattended combs. The resulting larvae burrow and eat into the combs, leaving behind webbing and tunnels of silk. Fully grown larvae spin dense and tough white silk cocoons that are commonly found firmly attached to the frame or hive body. The cocoon is cemented into a boat shaped cavity that the larvae chew in the wood. This damage persists in equipment long after the wax moth emerges. Once the cocoon is spun, the larvae change to the pupal stage, and then develop into an adult wax moth.

WHAT CAN THEY BE CONFUSED WITH?

Wax moth larvae are similar to small hive beetle (SHB) larvae, however there are two simple distinguishing characteristics between the two pests. Firstly, SHB larvae cause the honey to ferment and the hive to become 'slimed out', which is not present when only wax moth are present. Secondly, wax moth larvae leave behind webbing mass and tough white cocoons on the frames and hive body, which are not present when only small hive beetle larvae are present.

Source: Susan Ellis, USDA APHIS PPQ, www.Bugwood.org

Greater wax moth larva

WHAT SHOULD BEEKEEPERS LOOK FOR?

Beekeepers should look for tunnels of silk throughout combs, cocoons stuck to frames and hive body parts as well as a disintegrating comb which is caused by larvae burrowing in the comb. Beekeepers should also specifically look through weak, stressed or queenless colonies, as well as unattended combs as these are the most susceptible to wax moth infestation.

HOW DO THEY SPREAD?

Wax moths mainly fly at night and are able to fly between hives and cause new infestations. The pest can also be spread between apiaries by the movement of infested hives.

WHERE ARE THEY NOW?

Both species of wax moth are present in all states and territories of Australia.

Source: Kathy Keatley Garvey, UC Davis Department of Entomology

Wax moth larvae and webbing in stored combs

Source: Chantal Forster

Wax moth cocoons stuck onto frames

HOW CAN BEEKEEPERS PROTECT THEIR HIVES AND PRODUCTS FROM WAX MOTHS?

The honey bees themselves are the best method of protection against wax moth. Beekeepers should always try to keep strong colonies with a high bee-to-comb ratio and a young and healthy queen bee. Beekeepers should also keep their apiary clean from weak or stressed colonies, dead out colonies, or old unattended combs which provide a perfect breeding environment for wax moth.

Beekeepers should store empty combs, supers and any wax moth affected material that has been cleaned to be reused in low temperature control rooms. Cool rooms maintained at 10°C or less will prevent wax moth reproduction and living larvae from becoming active. Freezing frames and hive parts at -7°C will kill all stages of wax moth within 4-5 hours.

For more information about wax moth, go to *www.beeaware.org.au/wax-moth*.
The BeeAware website contains extensive information on wax moth, including:

- Life cycle
- Appearance
- Similar pests
- Detection methods
- Spread and distribution
- Management options
- Additional fact sheets and videos

ESTABLISHED PEST

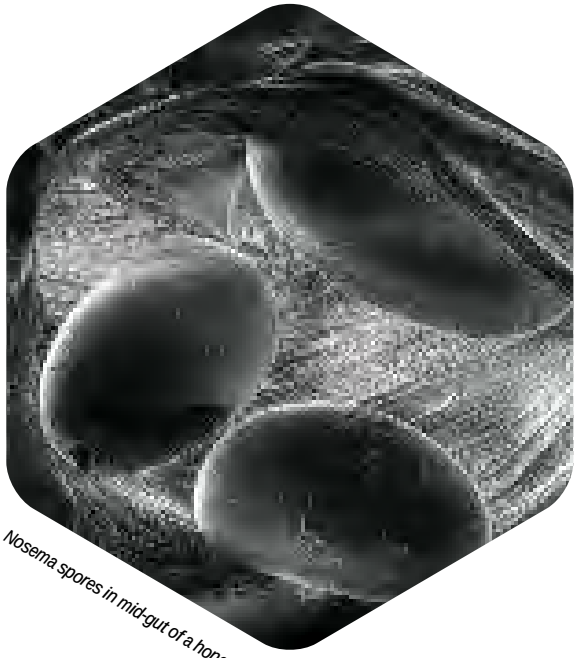
FACT SHEET
NOSEMOSIS

WHAT IS NOSEMOSIS?

Nosemosis, or nosema disease, is caused by two species of microsporidian parasites (a type of spore forming fungus) called *Nosema apis* and Nosema ceranae. Both species can infect worker bees, queen bees and drones. Both species produce spores which are ingested by adult honey bees through contaminated water or food, through food exchange with other honey bees or from cleaning contaminated combs. The spores then germinate in the mid-gut of the honey bee and infection may result in reduced adult honey bee life, colony health and performance.

Source: Food and Environment Research Agency (Fera), Crown Copyright

Hives should be regularly checked for signs of pests and diseases



Source: Food and Environment Research Agency (Fera), Crown Copyright

Nosema spores in mid-gut of a honey bee

WHAT DO THEY LOOK LIKE?

Nosema apis causes general symptoms such as crawling honey bees with swollen and greasy abdomens and dislocated wings, honey bees crawling onto and around the hive entrance, dysentery within and around the hive, a reduction in queen bee egg laying ability and her possible supersedure, as well as the rapid dwindling of colony strength and heavy winter losses. *Nosema ceranae* causes similar symptoms; however, none of the dysentery or crawling honey bee behaviour usually related to *N. apis* infection has been reported for *N. ceranae*. Signs of nosemosis are more evident in the cooler months, particularly in autumn and spring when nutrition is poor and/or weather conditions are cold and wet. Unlike *N. apis*, *N. ceranae* appears to thrive in warmer climates.

WHAT CAN THEY BE CONFUSED WITH?

There are no reliable field diagnostic symptoms associated with nosemosis, and many of the general symptoms associated with the disease could be confused with symptoms caused by other honey bee pests, diseases and/or disorders.

Source: D Broberg, www.flickr.com/photos/dbroberg

Honey bees defecating at the entrance of the hive can be a symptom associated with N. apis infection

WHAT SHOULD BEEKEEPERS LOOK FOR?

Beekeepers should look for colony symptoms such as a declining population, poor honey production, reduced brood production, dysentery in and around the entrance of the hive, poor survival over winter and worker bees crawling around the hive with swollen and greasy abdomens.

HOW DO THEY SPREAD?

Nosema spores are passed from infected honey bees to non-infected honey bees through contaminated water or food, through food exchange with other honey bees or from cleaning contaminated combs. It is also spread through bees removing waste material, specifically faeces from within and around the entrance of the hive. The spores are long lived and can quickly spread throughout the hive. Nosemosis can also be spread between colonies by using contaminated equipment and through the drifting behaviour of worker bees and drones.

Source: D Broberg, www.flickr.com/photos/dbroberg

Dysentery around the hive entrance

Source: Michael Plein

Dysentery within a hive

WHERE ARE THEY NOW?

Both species of nosema (*N. apis* and *N. ceranae*) are found in all states and territories of Australia, except for *N. ceranae*, which has not been reported in WA.

HOW CAN BEEKEEPERS PROTECT THEIR HIVES FROM NOSEMOSIS?

Good management practices such as appropriate nutrition, young queen bees with populous hives and comb rotation every 3 years will keep colonies strong and remove possible causes of stress.

Beekeepers should place their hives in a warm and sunny position over the autumn, winter and spring periods allowing the colony to regularly forage and defecate outside of the hive to prevent the accumulation of nosema spores in faeces deposited in the hive. Beekeepers should always ensure that any hive equipment that may have been infected with nosema spores is decontaminated before and after use.

For more information about nosemosis, go to *www.beeaware.org.au/nosema*.
The BeeAware website contains extensive information on nosemosis, including:

- Disease cycle
- Symptoms
- Similar pests
- Detection methods
- Spread and distribution
- Management options
- Additional fact sheets and videos

ESTABLISHED PEST

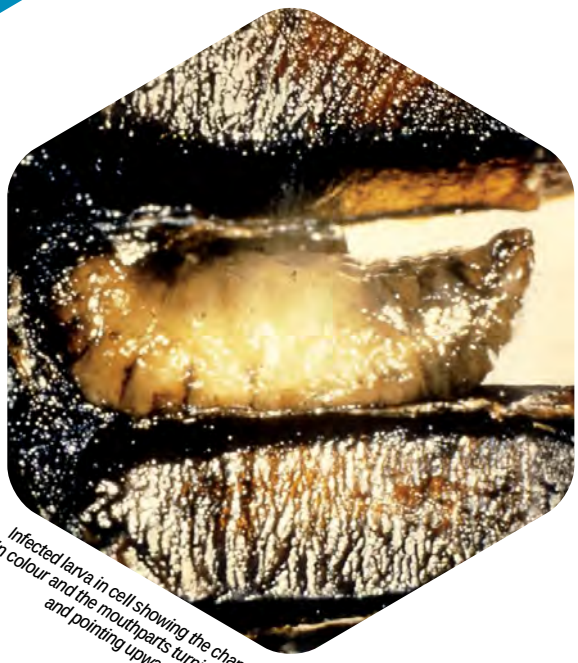
FACT SHEET
SACBROOD VIRUS

WHAT IS SACBROOD VIRUS?

Sacbrood virus is caused by the sacbrood virus (Iflavirus) which affects worker bee larvae thought to be infected by consuming contaminated water, pollen or nectar. Infected larvae die shortly after capping and become a fluid filled sac. Infected brood are found scattered amongst healthy brood and the cappings may be discoloured, sunken or perforated. Sacbrood virus may remain viable in dead larvae, honey or pollen for up to four weeks.

Source: Rob Snyder, www.beeinformed.org

Larva affected by sacbrood virus with its head raised in a banana shape and stretched out on its back in the cell, with healthy larvae around



Source: Food and Environment Research Agency (Fera), Crown Copyright

Infected larva in cell showing the change in colour and the mouthparts turning black and pointing upwards

WHAT SHOULD BEEKEEPERS LOOK FOR?

Beekeepers should look for symptoms of sacbrood virus such as an uneven brood pattern with discoloured, sunken or perforated cappings. Infected larvae change from a healthy pearly white, to yellowish, then grey-brown and finally dark brown-black. Darkening begins at the head of the dead larva and spreads to the rest of the body.

The skin of the dead larva also changes into a tough plastic-like sac, which is filled with fluid. The larva dies with its head characteristically raised in a banana shape toward the top of the cell and stretched out on its back in the cell. Nurse bees usually uncap the cell exposing the dead larvae.

WHAT CAN IT BE CONFUSED WITH?

Brood symptoms of sacbrood can be confused with other brood diseases such as European foulbrood (EFB) and American foulbrood (AFB). Unlike AFB infected larvae, the dried remains of sacbrood infected larvae are easily removed from their cells. The diseased remains appear first as a plastic like sac with darkening at the head and later as a dried scale, both of which appear banana shaped. If the ropiness test is used where a matchstick stick is put into the larval remains and the remains are drawn out in a ropy thread of up to 2-5 cm long, it indicates that the hive is infected with either EFB or AFB.

Source: Rob Snyder, www.beeinformed.org

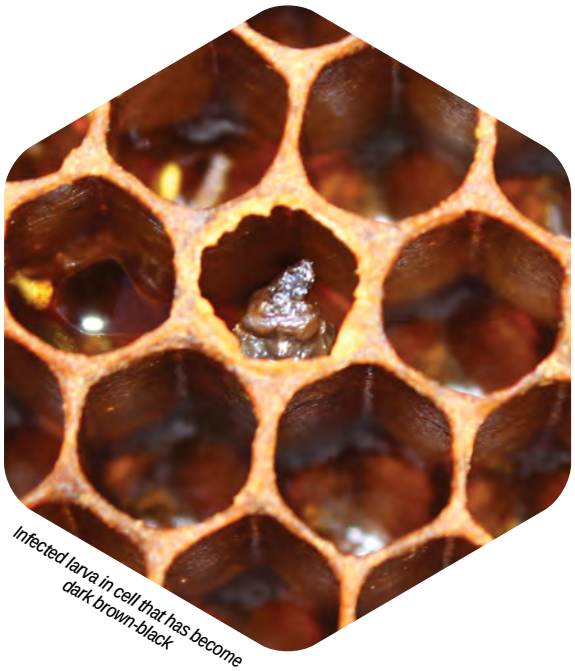
Old sacbrood virus infected larva turning brown

HOW DOES IT SPREAD?

Nurse bees transmit sacbrood virus when they feed larvae with infected brood food. Sacbrood virus may remain viable in larval remains, honey or pollen for up to four weeks. Honey bees drifting between hives, contaminated water and equipment can also spread sacbrood virus.

WHERE IS IT NOW?

Sacbrood virus is present throughout Australia; however, it has not been reported or confirmed in the NT.



Source: Rob Snyder, www.beeinformed.org

Infected larva in cell that has become dark brown-black

Source: Food and Environment Research Agency (Fera), Crown Copyright

Body of a sacbrood virus affected larva that **has become a fluid filled sac**

HOW CAN BEEKEEPERS PROTECT THEIR HIVES FROM SACBROOD VIRUS?

Honey bees are usually able to control sacbrood virus in most colonies through hygienic behaviour and the ability to detect and remove infected larvae. However, sacbrood virus can become severe when combined with other stresses, such as a shortage of nectar or pollen, unfavourable climatic conditions, a poor queen bee or infestation with other pests or diseases.

Beekeepers can protect their hives by removing infected brood combs and taking other management measures to restore colony strength, such as providing food and adding to the worker bee population.

Honey bee stocks can also differ in susceptibility to sacbrood virus, so beekeepers should replace the infected colony's queen bee with one supplied by a reputable breeder. This variation in susceptibility is due to differences in the hygienic ability of the honey bees to uncap and remove the infected brood. By selecting queen bees or obtaining honey bees from hives that show this trait, the effects of sacbrood virus can be reduced.

For more information about sacbrood virus, go to *www.beeaware.org.au/sacbrood*.
The BeeAware website contains extensive information on sacbrood virus, including:

- Disease cycle
- Symptoms
- Similar pests
- Spread and distribution
- Management options
- Additional fact sheets

ESTABLISHED PEST

FACT SHEET
SMALL HIVE BEETLE

WHAT IS SMALL HIVE BEETLE?

Small hive beetle (SHB) (*Aethina tumida*) is a small (0.5 cm long 0.3 cm wide) brown-black beetle with clubbed antennae. The larvae of SHB cause the majority of damage to honey bees by burrowing into combs, eating brood, honey and pollen. Whilst feeding, the larvae also carry a yeast (*Kodamaea ohmeri*) which contaminates the honey, causing it to ferment. Heavy infestations cause the hive to become 'slimed out' and may cause the colony to die or abscond. In Australia, SHB has the greatest impact in the warm and humid coastal strip between Victoria and North Queensland.

Source: James D Ellis, University of Florida

Adult SHB are brown-black with clubbed antennae

Source: Ken Walker Museum Victoria, PADIL

Larvae of SHB are pearly white and about 10 mm long

WHAT DOES IT LOOK LIKE?

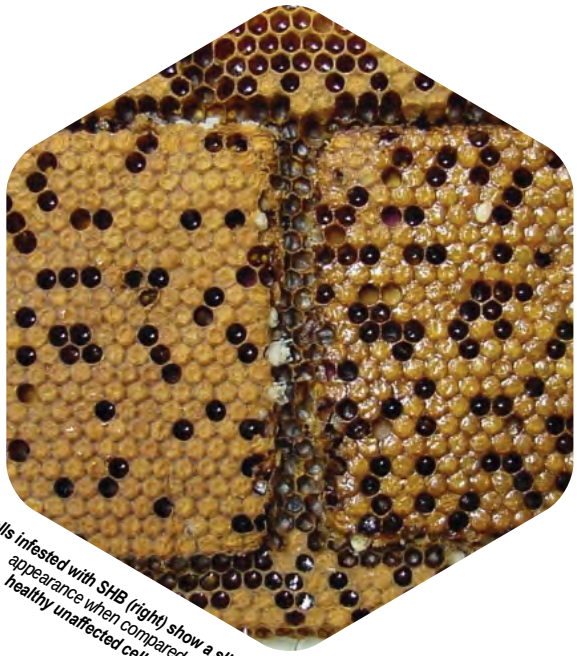
Adult SHB are brown-black. The eggs are tiny (about 1 mm long) and are pearly white. In strong colonies, eggs are laid in the crevices of the hive, while in weak colonies eggs are laid directly on brood comb. Larvae are white, 10 mm long with three pairs of prolegs near the head. Once they mature, larvae leave the hive and burrow into the ground surrounding the hive to pupate.

WHAT CAN IT BE CONFUSED WITH?

SHB larvae look similar to wax moth larvae. To distinguish between the two pests, SHB cause the honey to ferment and the hive to become 'slimed out', while wax moth larvae leave behind webbing mass and tough white cocoons on frames.

WHAT SHOULD BEEKEEPERS LOOK FOR?

Beekeepers should look for the adult SHB in the darker parts of the hive. Adult SHB avoid light and will seek refuge quickly when the hive is inspected. Inspect underneath the hive lid, as well as the brood box and bottom board. Weak and stressed colonies with a low bee-to-comb ratio are considered the most susceptible. Also look for larvae on frames in the brood box and in the above honey supers.



Source: Kieth Delaplane, University of Georgia

Cells infested with SHB (right) show a slimy appearance when compared to healthy unaffected cells (left)

The larvae cause the majority of the damage by burrowing into combs, eating brood, honey and pollen. Whilst feeding, the yeast species (*K. ohmeri*) that the larvae carry contaminates the honey, causing it to ferment, which makes the honey look greasy and slimy and weep out of the cells.

HOW DOES IT SPREAD?

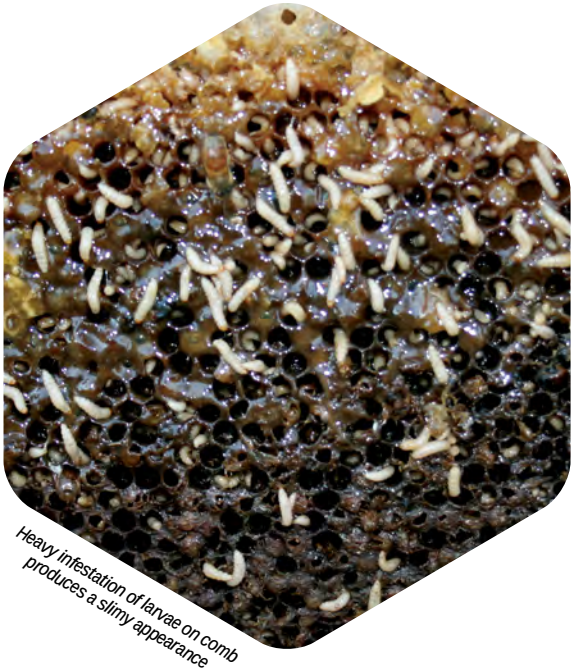
SHB can spread by beekeepers moving infested hives to non-infested areas. SHB is also a strong flyer and can fly up to 7 km to find new hives and colonies. The SHB is believed to be attracted to new hives by honey bee colony odours and slumgum.

WHERE IS IT NOW?

SHB is present throughout NSW, Qld, Vic, ACT and in parts of SA and WA. It has not been recorded in NT or Tas.

Adult SHB are about 2-3 times smaller than honey bees

Source: Jessica Lawrence, Eurofins Agroscience Services



Heavy infestation of larvae on comb produces a slimy appearance

Source: Nick Annand, NSW DPI

HOW CAN BEEKEEPERS PROTECT THEIR HIVES FROM SMALL HIVE BEETLE?

To protect hives against SHB it is critical to maintain strong, healthy colonies with a young productive queen bee and a high bee-to-comb ratio. Beekeepers should maintain good hygiene practices in the hive (e.g. remove debris on bottom boards, remove burr comb etc.) to reduce areas where SHB can hide and breed. It is also important to maintain good hygiene practices around the apiary (e.g. remove beeswax scraps, old combs and dead colonies etc.) which can attract SHB. Cool rooms maintained at 10°C or less for excess supers and combs will prevent the adult SHB laying eggs and will minimise SHB larvae activity. Freezing frames and hive parts at -7°C will kill all life stages of SHB within 4-5 hours. A range of in-hive chemical and non-chemical options are also available to beekeepers.

Please Note: The SHB larvae carry a yeast species (*Kodamaea ohmeri*) that poses a threat to immuno-compromised people. Be aware of the risk of handling and cleaning SHB slimed honey bee equipment and take precautions.

For more information about SHB, go to *www.beeaware.org.au/small-hive-beetle*.
The BeeAware website contains extensive information on SHB, including:

- Life cycle
- Appearance
- Similar pests
- Detection methods
- Spread and distribution
- Management options
- Additional fact sheets and videos

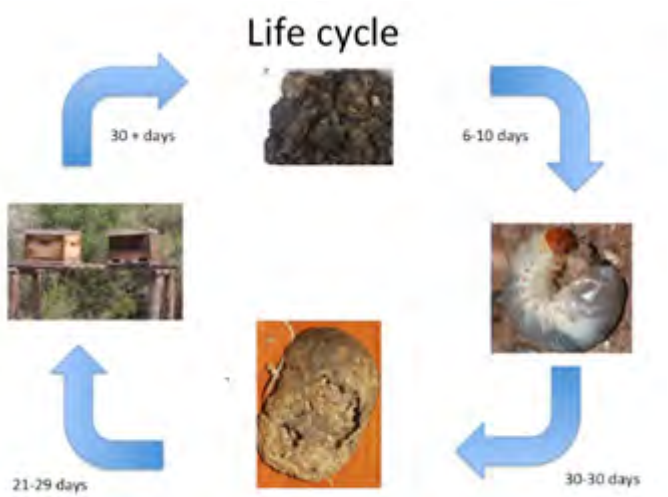
EXOTIC PEST

FACT SHEET
LARGE HIVE BEETLE

The Large hive beetle (*Oplostomus fuligineus*) is around 20–23mm long with a shining black body and is an insect pest of honey bee brood that is native to regions of Africa. Another closely related species, *Oplostomus haroldi* has also been observed as a pest of honey bee brood, and less commonly honey and pollen, in honey bee colonies in regions of Africa.

Very little is known about the life cycle and biology of these exotic scarab pests of honey bees.

Unlike other insect pests of honey bees that originate from Africa, such as the Small hive beetle, which can reproduce inside the honey bee colony, it appears that the Large hive beetle requires decomposing plant material and herbivore faeces (commonly cattle dung) for oviposition and development.



Life cycle of large hive beetle. Ben Oldroyd, University of Sydney


Source: Ben Oldroyd, University of Sydney

There also seems to be a strong preference with the Large hive beetle for eating honey bee brood, instead of other hive food sources, such as honey and pollen. Considering the large nature of the insect, and its ability to quickly consume brood, this feeding behaviour can quickly destroy the comb structure within the hive. Considering its greater size than the honey bee, it appears that beekeepers in Africa use smaller entrances for the hives, which restricts the access of the beetles into the hives, thus controlling the pest.

The Large hive beetle is currently not present in Australia and there are strict quarantine requirements in place to protect the Australian honey bee industry.

EXOTIC PEST

FACT SHEET
ASIAN HORNET

The Asian hornet (*Vespa velutina*) is an invasive predatory pest that originates from Asia. There is a dozen known sub-species of the Asian hornet. While typically all hornets are predators of insect species, the Asian hornet has been seen as a significant problem for beekeepers due to its aggressive and effective predation of the European honey bee and wild bee populations.

Asian hornets have a direct impact on honey bee colonies by killing honey bees and honey bee brood to feed their own brood larvae. Asian hornets also have an indirect impact on hive health by causing honey bees to spend time and energy mounting a defence to the constant threat of attack and thereby inhibit foraging activities. This in turn decreases the productivity of the honey bee colony, which not only leads to reduced honey and pollen reserves, but also puts at risk the developing brood and the ability of the hive to provide effective pollination services.

Asian Hornet

Source: Food and Environment Research Agency (Fera). Crown Copyright

Old Asian Hornet nest

Source: Food and Environment Research Agency (Fera), Crown Copyright

The life cycle of the Asian hornet is annual. Fertile female Asian hornets are stimulated to begin laying by warmer temperatures in spring. The fertile female will begin to build a small roughly shaped nest in which to lay her new brood. A single queen will only produce one nest in her year life cycle.

Like other social insect species, the Asian hornet workers produced by the queen are sterile and live between 30–55 days depending on temperature. The workers forage for food to feed the queen and the developing brood, as well as continue to construct and expand the nest. Depending on the local conditions, a hornet nest around 90cm in height can house between 500–1500 hornets.

Toward the end of summer and into autumn, reproducing females and males emerge from the nest to mate. The Asian hornet workers remaining in the nest will die in the cooler temperatures and the nest will be abandoned. Asian hornets do not reuse the abandoned nest. The descendent fertilised female Asian hornets will over winter in insulated and sheltered cavities (such as under bark or in the small hollows of trees), alone or in small groups, before emerging to establish a new nest in the spring.

EXOTIC PEST

FACT SHEET

DWARF HONEY BEE

Dwarf honey bees are by far the most common honey bees throughout tropical Asia. The most common of the dwarf honey bees, is the Red dwarf honey bee (*Apis florea*) which is naturally distributed from the Indian subcontinent throughout south-east Asia through to the Malaysian peninsular. Another dwarf honey bee species, the Black dwarf honey bee (*Apis andreniformis*), is less common but is still widely distributed from the Philippines to China and Myanmar. Both species overlap in south-east Asia.

Source: Sam Malfroy

APPEARANCE AND BEHAVIOUR

Both species of dwarf honey bee look very similar. The Red dwarf honey bee is red-brown and has quite distinct red/brown and white and black bands on the abdomen. A foraging worker bee body length is 7–10 mm, while the forewing length is between 6.0–6.9 mm. The Black dwarf honey bee is roughly the same size, but is blacker in colour, as the name suggests.

Their nesting biology is also very similar. Dwarf honey bees are characterised by their external nesting habits and their single comb. Dwarf honey bee nests consist of a small single comb (usually less than 25 cm across) nest that is built around a small branch. This small nest contains a crown above the branch for honey storage, as well as being used by the bees as a platform for the foragers leaving and arriving at the nest. The brood comb is suspended below the supporting branch in a single comb. The curtain of bees for a large dwarf honey bee colony is usually 3–4 bees thick. On either side of the nest on the branch, the honey bees commonly place a propolis barrier on the branch which acts as a sticky and repellent barrier to protect the nest from attack by other insects, such as ants.

Given that dwarf honey bee colonies are usually very small (usually only a few thousand bees), and that they only produce a single comb with very little honey, dwarf honey bees have not been domesticated for honey production or pollination services. Apart from their small size and simple single comb exposed nests, much of their life cycle, biology and behaviour is similar to that of other Apis species.

Source: Dani Jump

DISTRIBUTION

Dwarf honey bees typically establish their colonies in cryptic nest sites, and due to the fact that they are not very aggressive, they can easily stay undetected for a long time. It is believed that this behavioural trait has assisted in the spread and expansion of the Red dwarf honey bee throughout the Middle East and into eastern Africa.

The Red dwarf honey bee is now widely present in the Middle East, including Iran, Iraq, Israel, Jordan, Yemen, and Saudi Arabia as well as in Sudan in eastern Africa where populations of Red dwarf honey bee have been accidentally introduced. Reports from these areas suggest that the Red dwarf honey bee is continually expanding westward in an invasive manner and has even started to rob European honey bee hives, even in areas where there are dense populations of European honey bees.

ASSOCIATION WITH MITES

One of the major risks for Australia if dwarf honey bees were to enter the country is the exotic parasitic mites that a nest may carry. Both the Red dwarf honey bee and the Black dwarf honey bee are parasitised by *Euvarroa wongsirii* and *Euvarroa sinhai*, both of which are close relatives to the Varroa mite.

Some research has been conducted on the ability of Euvarroa to parasitise European honey bees (*A. mellifera*) and survive on European honey bee adults, however, research into this area is very limited, and the scenario of Euvarroa parasitising European honey bees is considered highly unlikely. The ability of Euvarroa to parasitise European honey bees in the natural environment of Asia, where the native dwarf honey bees exist with the introduced European honey bees, has not been observed or reported to date.

Despite dwarf honey bees being parasitised by these mites, reports suggest that they cause minimal impact for dwarf honey bee colonies as they are restricted to reproducing on drone brood.

In addition to the Euvarroa mites, tropilaelaps mites (*Tropilaelaps clareae*) have been observed on Red dwarf honey bee colonies. Tropilaelaps mite is capable of jumping over to European honey bee colonies. Parasitic mites such as these pose a constant threat to Australia's honey bee population. Status in Australia Dwarf honey bees, and parasitic mites such as Euvarroa and tropilaelaps species are currently not present in Australia and there are strict quarantine requirements in place to protect the Australian honey bee industry.

EXOTIC PEST

FACT SHEET

GIANT HONEY BEE

Giant honey bees are the largest of the honey bee species. The Giant honey bee (*Apis dorsata*) is very large (17–20 mm long) however their colour is quite similar to the European honey bee, with golden, black and pale bands on the abdomen and with a hairy thorax. Their forewing length can vary from between 12.5–14.5 mm. The Giant honey bee is widely distributed throughout south-east Asia, ranging from the Indian subcontinent, up to southern China and down throughout Indonesia and Malaysia.

There are two closely related species to *A. dorsata*. This includes the slightly larger Giant Himalayan honey bee (*Apis laboriosa*) which is only present in the mountainous regions, particularly the Himalayas above 1500 m. The other closely related species is the Giant Philippine honey bee (*Apis breviligula*) which is restricted to a small cluster of islands in the Philippines.

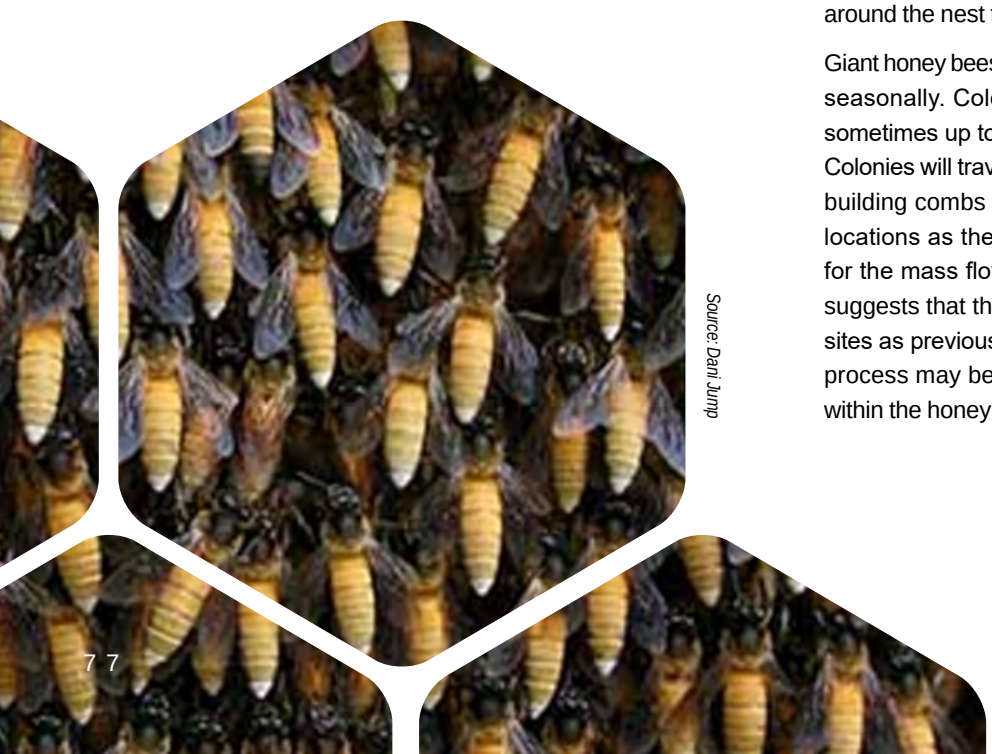
Source: Zachary Huang

APPEARANCE AND BEHAVIOUR

The nests of giant honey bees are large single combs which can measure up to 1.5 m in width and 1 m in depth. This large single comb can contain upwards of 60,000 bees. Unlike dwarf honey bees or cavity nesting honey bee species, colonies of giant honey bees can be highly clustered in a specific location, with some trees in Asia (termed 'bee trees') containing multiple nests in a single tree, sometimes up to 50 nests.

Giant honey bee nests are usually built in exposed places far off the ground, sometimes 20–40 m high on thick branches of tree limbs, overhanging rocks or cliffs, or on buildings or other man-made structures. The key difference between dwarf honey bees and giant honey bees, apart from their nest size, is that giant honey bee nests hang underneath a structure such as a branch, whereas dwarf honey bee nests are wrapped around a structure such as a branch. Giant honey bee colonies can be quite aggressive, and because of this, around three quarters of the population of a giant honey bee colony are engaged in colony defence, forming a protective curtain around the nest that is three to four bees thick.

Giant honey bees are mainly tropical and in most places they migrate seasonally. Colonies are capable of migrating great distances, sometimes up to 200 km, as they follow the wet and dry seasons. Colonies will travel for many months, resting in trees along the way, building combs and honey reserves and then moving on to new locations as the forage decreases, before setting up new nests for the mass flowering of the monsoon season. Some evidence suggests that the bees are capable of returning to the same nest sites as previous years, even though all of the original bees in the process may be replaced. This mechanism of memory retention within the honey bee colony remains a mystery.



Source: Dani Jump

ASSOCIATION WITH MITES

One of the major risks if giant honey bees were to enter Australia is the exotic parasitic mites that nests or swarms may carry. All species of the giant honey bee are parasitised tropilaelaps mites (*Tropilaelaps clareae*, *T. mercedesae*, *T. thaii* and *T. koenigerum*). Not all of the tropilaelaps mites can parasite all giant honey bee species as some of the mite and host relationships can be quite specific. However, both *T. clareae* and *T. mercedesae* are capable of parasitising European honey bees (*Apis mellifera*) as well, which can cause rapid colony decline and possible death. For these reasons, parasitic mites such as tropilaelaps species pose a constant threat to Australia's honey bee population.

STATUS IN AUSTRALIA

Giant honey bees, and parasitic mites such as tropilaelaps species are currently not present in Australia and there are strict quarantine requirements in place to protect the Australian honey bee industry.

Source: Rison Thumboor

EXOTIC PEST

FACT SHEET
CAPE HONEY BEE

The Cape honey bee (*Apis mellifera capensis*) is a subspecies of the honey bee (*Apis mellifera*) and is native to the Eastern and Western Cape provinces of South Africa. In its natural environment (the Fynbos region of South Africa), the Cape honey bee can be readily managed for the purposes of honey production and pollination, just like other races and strains of the European honey bee.

However, the Cape honey bee has a distinct reproductive system which makes it unique amongst other subspecies of Apis. This unique reproductive system causes major problems for beekeepers in its natural environment of South Africa where it acts as a 'social parasite'.

Source: Ben Oldroyd, University of Sydney

Cape honey bee (black abdomen) next to Africanised honey bees (golden abdomen)

Cape honey bees are generally darker in colour and slightly smaller in size than European honey bees; however, the only way to accurately tell the difference between Cape honey bees and European honey bees is through genetic analysis. Apart from these minor differences, the Cape honey bee looks nearly identical to the European honey bee to the naked eye. The main differences between these bees are displayed through their behavioural traits. This includes:

- Cape honey bees swarm and abscond much more frequently than other races of European honey bees. Typical European honey bee colonies will swarm once every 12 months, while Cape honey bees are capable of swarming every month or two.
- Cape honey bees are more 'flighty' than European honey bees and commonly leave the hive when it is being inspected.
- Cape honey bee colonies grow faster and tend to be smaller than European honey bees. Cape honey bees also store less honey than European honey bees.
- Unlike the closely related African honey bee, the Cape honey bee is quite docile.

Source: Mike Allsopp

EXOTIC PEST

FACT SHEET
AFRICANISED HONEY BEE

The Africanised honey bee is a hybrid of several European honey bee subspecies (*Apis mellifera mellifera*, *A. m. carnica*, *A. m. caucasia* or *A. m. ligustica*) and the African honey bee (*A. m. scutellata*).

In the 1950s the African honey bee was introduced into Brazil in South America for breeding purposes. Unfortunately, the African honey bee escaped the breeding trial and starting breeding with the local populations of European honey bee (*Apis mellifera*). This was able to occur because all subspecies of *Apis mellifera* are capable of interbreeding or hybridising. Consequently, African honey bee hybridisation with European honey bees became frequent, as the African honey bee moved into areas which were previously occupied by European honey bees.

The Africanised honey bees have a much greater aggressive and defensive behaviour than European honey bees and because of this rapid hybridisation, they were quickly able to out-compete the European honey bee. As of 2012, the Africanised honey bees had saturated Central and South America and had established in many southern states of the USA.

As with all subspecies of *Apis mellifera*, the African honey bee and the European honey bee are able to hybridise. It is this hybridisation with the European honey bees that earned the name 'Africanised' honey bees. Therefore, the term 'African honey bee' refers to the pure race which is naturally found in Africa, while the term 'Africanised honey bee' refers to a hybrid.

Although measurement of wing venation, and size and colour of body parts can provide some preliminary diagnostic information, the only way to accurately identify whether a colony contains Africanised honey bee stock is through genetic analysis. Apart from being slightly smaller in size and a bit darker in colour, the Africanised honey bee looks nearly identical to the European honey bee to the naked eye. The main differences between these bees are displayed through their behavioural traits.

These include:

- Africanised honey bees swarm and abscond much more frequently than other races of European honey bees. Typical European honey bee colonies will swarm once every 12 months, while Africanised honey bees are capable of swarming every month or two which saturates the area with Africanised honey bees.
- Africanised honey bees have a heightened defensive behaviour compared to other European honey bees. This can result in the Africanised honey bees defending a greater radius around their nest and attacking with many more individual bees than European honey bees would. Although they have been termed 'killer bees' in the USA, they do not have a more potent or a larger amount of venom than other honey bees, they just attack more aggressively with more individual bees.
- Africanised honey bees are less selective with nesting sites and can nest in much smaller volumes than European honey bees.
- Africanised honey bees are more 'flighty' than European honey bees and commonly leave the hive when it is being inspected.
- Africanised honey bee colonies produce more drones per colony than European honey bees and their colonies grow faster and tend to be smaller than European honey bees. Africanised honey bees also store less honey than European honey bees.

GLOSSARY

TERM	DEFINITION
Abscond	When the entire colony of honey bees abandons the hive because of pests, diseases or other adverse conditions.
Apiary	A group of hives assembled in one area or location for beekeeping operations; also known as a bee yard.
Biosecurity	A set of measures designed to protect honey bees from the entry and spread of pests at a national, regional and individual property or apiary level.
Brood	Immature honey bees that have not yet emerged from their cells. Brood can be in the form of eggs, larvae, or pupae of different ages.
Brood box	Usually the bottom box of the hive used for rearing honey bees.
Colony	A colony of honey bees that consists of worker bees, drones, queen bee and developing brood living together as a social unit in one hive, or other dwelling.
Comb (honey comb)	A structure of beeswax built by honey bees in an array of hexagonal cells for storing nectar, honey, pollen and/or brood.
Drifting	The process by which honey bees join a hive other than their own, often due to loss of direction or hives placed too close together.
Drone	Male honey bee.
Endemic	Pests that are present in regions of Australia.
Established	Pests that are established throughout Australia, or regions of Australia.
Feral bees	Honey bees that are not managed by a beekeeper and live wild in the environment.
Frame	A construction of wood or plastic containing wax or plastic foundation and used in hives.
Hive (bee hive)	A series of boxes, including a brood box and supers, used for housing a colony of honey bees.
Hive tool	A flat metal device with a curved scraping surface used to open hives and pry apart and scrape frames.
Migratory beekeeping	The moving of colonies of honey bees from one locality to another during a single season to take advantage of multiple honey flows.
Package bees	A quantity of adult honey bees (1.5-2 kg), with or without a queen bee, contained in a screened shipping cage with a food source.
Pollination	The transfer of pollen from the anthers to the stigma of flowers.
Queen bee	A female honey bee with a fully developed reproductive system responsible for the egg laying in a colony.

TERM	DEFINITION
Queen excluder	A metal or plastic screen used to confine the queen bee to the brood box.
Requeening	The replacement of the queen bee in the hive with another (usually younger) queen bee.
Robbing	The stealing of nectar or honey by honey bees from other colonies which happens more often during a nectar dearth.
Smoker	Device used to blow smoke on honey bees to calm them and thus reduce stinging of the operator.
Super	A separate box that contains frames and is placed on top of the brood box. It is part of the hive and used for the storage of surplus honey for harvest.
Supersedure	The natural replacement of an established queen bee by a queen bee newly reared by the colony in the same hive.
Surveillance	The collection, collation, analysis, and dissemination of pest and disease data.
Swarm	A large number of worker bees, drones and usually the old queen bee that leaves the parent colony to establish a new colony.
Wax (bees wax)	Wax secreted from glands on the underside of the worker bee abdomen and moulded by honey bees into honey comb.
Worker bee	A female honey bee.