



HONEY BEE HEALTH ASSESSMENT

By Alan Baxter

COURSE CONTENT - THEORY - TWO SESSIONS

Session 1

Role of good hygiene in the apiary

Current regulations

Notifiable and reportable pests and diseases

American foulbrood

European foulbrood

Other brood diseases

SESSION 2

Viruses

Nutrition and spray poisoning

Pests:

Varroa

Parasitic Mite Syndrome

Wax moths

Other pests

Potential new threats

Notifiable

Mandatory by law

Must be reported to a government authority as soon as suspected or detected

Triggers a rapid government response

Reportable

Must be recorded and reported through specific channels

Does not require immediate notification

Less urgent than notifiable

Bee Diseases and Pests Control (England) Order 2006

Notifiable

American foulbrood (AFB)

European foulbrood (EFB)

Small hive beetle (*Aethena tumida*)

Tropilaelaps

Varroa (considered endemic)

Reportable

Asian Hornet (*Vespa velutina nigrathorax*)

<https://www.gov.uk/guidance/bee-health>

<https://www.legislation.gov.uk/ukxi/2006/342/contents>

GOOD HYGIENE IN THE APIARY

- **Personal**
- **Equipment**
- **Comb**
- **Biosecurity**



American foul brood

- *Paenibacillus larvae*



ADULT BEE DISEASES

Nosema

Amoeba

Acarine

Deformed Wing Virus

Chronic Bee Paralysis

AFB field diagnosis - signs

- **AFB - A for After the cell has been capped**
- **Pepperpot brood pattern**
- **Dark, sunken greasy-looking cappings**
- **Contents pull out into a rope - clear diagnosis**
- **Dead larva dries into hard, dark scales in base of cell that bees cannot remove**
- **Heavily infected with spores**
- **Spores can last up to 50 years**
- **Bee Inspector might carry out LFT and send sample to lab for analysis.**

- **Healthy cappings are biscuit-coloured**
- **Cappings become sunken, greasy and dark**

Developing brood inside dies

- **Adult bees nibble holes to try to remove infected larvae**

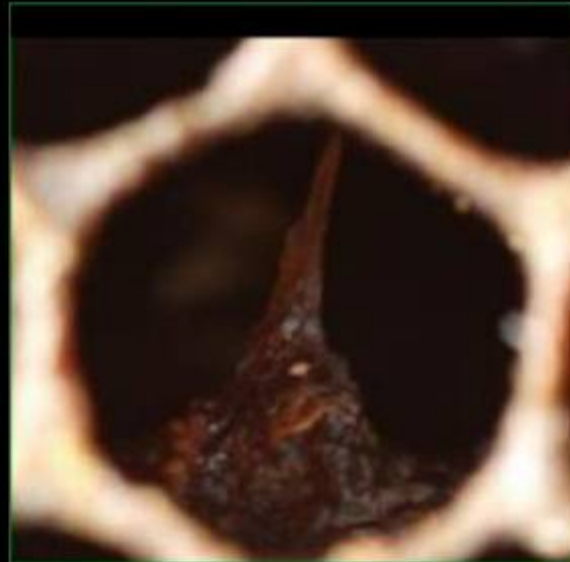


Remains light to dark brown in colour

Matchstick in dark slimy looking capping

Remains pull out into a dark, mucus-like rope 10-30mm long

Dark scale in base of cell



What should I do if I suspect Foulbrood ?

- **Contact the NBU immediately by emailing: NBU@apha.gov.uk or calling: 0300 303 0094.**
- **Or contact your local Seasonal or Regional Bee Inspector.**
- **Self impose standstill on your apiary and don't move any equipment or bees until it has been inspected by an inspector.**
- **Do not move any bees to or from the colony. Disinfect all equipment that may have come into contact with the suspect colony.**
- **Reduce the entrance on the suspect colony.**
- **If possible, take photos of the suspicious cells to show the Bee Inspector.**
- **Destroy gloves**
- **Sterilize hive tool and all other equipment**
- **Wash beesuit in strong soda crystals and bleach solution**

Actions by Bee Inspector

- **Impose official standfast order**
- **Primary confirmation of diagnosis with rope test**
- **Lateral Flow Test**
- **Samples taken and sent to Fera Science Ltd for official confirmation**
- **Burn and bury all the infected hive and contents**
- **Inspect stored equipment**
- **Will issue certificate of proof if requested for insurance claim from BDI**
- **Return min 6 weeks**

Prognosis

- **At present incurable due to high resilience of spores**
- **Only treatment is total destruction of all stock and equipment**
- **Close attention to biosecurity - quarantine**



EUROPEAN FOULBROOD (EFB)

European foulbrood - causative organism

- **Melissococcus plutonius**
- **Gram positive bacterium**
- **Some strains more virulent than others**
- **Causes death by starvation**
- **Parasite not pathogen**



EFB - Signs

- **E for early - signs occur before the cell is capped**
- **Scattered brood pattern where house bees have cleaned out infected cells**
- **Younger larvae die and become transparent losing their segmentation**
- **Lying uncomfortably in their cells**
- **Older larvae twist and become transparent**
- **Larva turns yellow with white lines visible through the skin**
- **Larva dries into a loose brown scale that the bees can easily remove**

**EFB infected larvae
sit uncomfortably in
cells**

**May become twisted
and look melted
down**



- **Gut of infected larva visible through body wall, creamy colour from mass of bacteria inside.**
- **Nearby larvae look yellow and not sitting neatly in cell.**



Larva gut fills with mass of bacteria.

Mass expands and takes over most of the gut



**Dead larvae dry out into brown
rubbery scale.**

**Bees remove scales
-become
contaminated**

**heavy infection brood pattern
patchy**



Development of disease

if there's not enough food for larva and bacteria

- **Infected larva dies of starvation**
- **Bacteria remain in dead larva**
- **Dead larva removed from colony by the house bees who become infected**
- **Level of infection in the colony appears to have reduced**
- **BUT:**
- **EFB has not disappeared**

If there is a plentiful food supply

- **The infected larva survives**
- **May only have received a small amount of bacteria**
- **There may enough food for both the larva and the bacteria to survive together**
- **Larva pupates and at the fifth moult the gut opens and the pupa defecates**
- **The new bee emerges and is heavily infected**
- **Comb contaminated with millions of infective bacteria in the faeces**
- **House bees clean cell are contaminated and spread the bacteria**
- **Perversely, larvae that survive perpetuate the disease in the colony**
- **Bacteria can live in comb for up to 5 years**

Actions by beekeeper

- **Stop inspection immediately**
- **Take photo**
- **Ring Bee Inspector**
- **Close entrance to one beespace until dusk then close altogether**
- **Put apiary in quarantine until Bee Inspector arrives**
- **Sterilize all equipment used**
- **Destroy gloves**
- **Wash beesuit in solution of soda crystals and bleach**
- **Wash boots in same**

Actions by bee inspector

- **Carry out LFT**
- **Take sample for lab analysis**
- **Order immediate stand still**
- **Options depending on severity of infection:**
 - **Change all comb by shook swarm in all the hives or**
 - **Burn hive and contents and bury 1 metre.**
 - **Inspect all other hives and apiaries**
 - **Inspect stored equipment**
 - **Return minimum 6 weeks later**
 - **Movement licence MAY be granted to allow extraction of honey in exceptional circumstances**

SACBROOD

- **Causative organism: Sacbrood virus**
- **Not usually a serious problem but in some cases can lead to death of colony**
- **Used to be called pickled brood**
- **Has existed in honey bees for a very long time**
- **Infected with sacbrood fail to pupate and die just after capping**
-

WHAT TO LOOK FOR

- **Body wall thickens and the larva can easily be removed from the cell intact**
- **Bees will uncap the cells and attempt to remove the diseased larvae.**
- **Common to find uncapped cells containing dead larvae**
- **In capped cells where the larva has died cappings will be punctured by the bees.**
- **Larvae upturned in their cells - typical Chinese slipper shape**
- **Turn yellow during the first stages of decomposition**
- **Skin toughens and the sac becomes filled with fluid**
- **Later stages of decomposition, the larval remains begin to dry out**
- **Final stage of decomposition larva rots down into a dry, dark scale**
- **If you rupture the sac you will find the contents to be a granular, brownish liquid**



SACBROOD PREVENTION AND TREATMENT

Usually well-managed by the bees

Does not normally lead to serious colony losses.

Good hygiene on the part of the beekeeper will help prevent spread

Colonies with persistent infections may benefit from requeening with less-susceptible stock

Honey and frames from an infected colony should not be transferred to other colonies.

No treatment for viruses

Experiments with antivirals not been fully field tested

CHALK BROOD

Causative organism : *Acosphaera apis*

Fungus disease of developing brood

Characterized by:

- **Spongy white larvae**
- **Dried, hard white larvae in uncapped cells**
- **Hard, chalk-like 'mummies' on hive floor or ground outside**
- **One of 3 most prevalent diseases in Britain**

CHALK BROOD



Conditions leading to Chalkbrood

Often occurs in spring

Weak colonies

**Not enough bees to cover the brood - winter
bees dying**

**Temperature of brood nest drops below 32-35
deg C**

Might be accompanied by chilled brood

PREVENTION AND TREATMENT FOR CHALKBROOD

- **Good apiary hygiene**
- **Replacing storage and brood combs regularly**
- **Keeping hives well-ventilated and dry**
- **Not transferring material between colonies if infection is present.**
- **Some strains of honey bee are naturally more resistant to chalkbrood than others.**
- **For recurring chalkbrood re-queen the colony from a more hygienic stock.**
- **Some have a genetic trait called social fever - the bees raise the temperature to the point where the chalkbrood infection cannot live.**



Transmission

Spread by adult bees through robbing and by drifting.

Between bees in the colony via the faecal-oral route

Queens may transfer the virus onto their offspring via their eggs

Virus can remain viable in honey or pollen for a month,

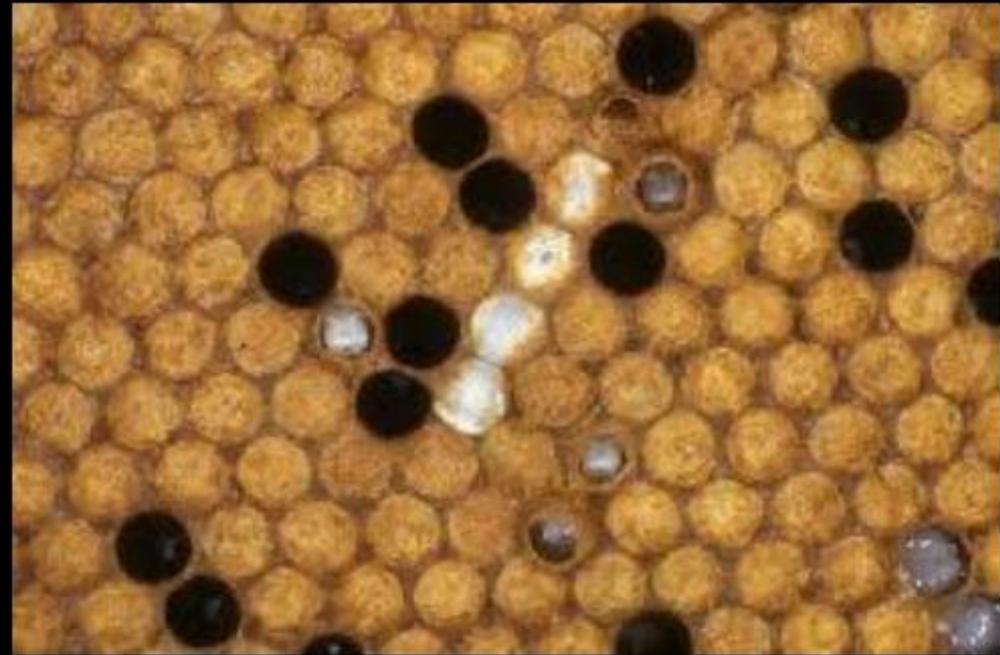
Transmitted by the movement of frames between colonies.



Bald brood

- **common disorder where pupae become uncapped**
- **continue development exposed on the frame within the colony.**
- **Thought to be caused by both the lesser wax moth, *Achroia grisella*,**
- **and greater wax moth, *Galleria mellonella*,**
- **when their larvae tunnel under the brood cappings**
- **We will look at this in detail when we do wax moth in session**

BALD BROOD



CHILLED BROOD

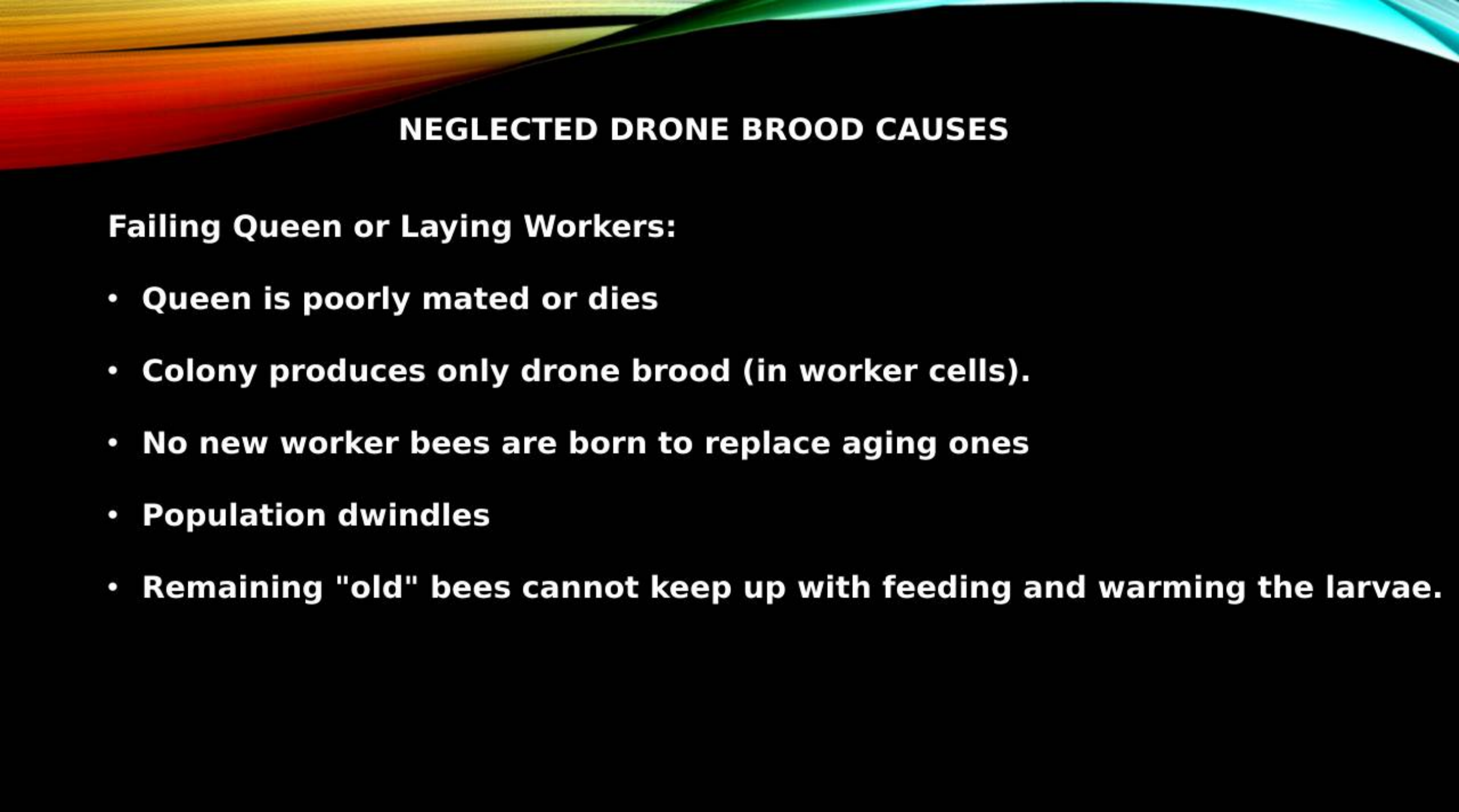
- **Caused by brood losing heat**
- **Often in spring when colony expanding quickly and not enough bees to keep the brood warm**
- **Sudden frost - bees cluster round queen and abandon brood**
- **Beekeeper giving stimulative feeding**
- **Doing splits or other means of making increase - not enough bees to cover the brood**
- **Brood at periphery of brood nest dies and turns black**





NEGLECTED DRONE BROOD

- **Not a disease**
- **Specific colony condition**
- **Occurs when worker bees are under environmental or internal stress**
- **Stop providing the necessary care (warmth and food) to drone larvae or pupae.**



NEGLECTED DRONE BROOD CAUSES

Failing Queen or Laying Workers:

- **Queen is poorly mated or dies**
- **Colony produces only drone brood (in worker cells).**
- **No new worker bees are born to replace aging ones**
- **Population dwindles**
- **Remaining "old" bees cannot keep up with feeding and warming the larvae.**

NEGLECTED DRONE BROOD - SIGNS

- **Decomposition:**
- **Neglected larvae lose their shape**
- **Turn yellowish-brown**
- **Melt into a watery mass or**
- **Dry into a scale that bees may fail to remove.**
- **Stunted Growth:**
- **Drones reared in smaller worker cells (common with laying workers) will be stunted and malformed.**
- **Irregular misshapen cappings**
- **Sunken, dark, or greasy-looking cell cappings**

NEGLECTED DRONE BROOD CAUSES - CONT

MITE INFESTATION:

- **High levels of *Varroa* mites, which prefer drone brood**
- **Can lead to Parasitic Mite Syndrome**
- **Causes patchy, "pepperpot" brood patterns where larvae are left to die and discolour.**

- **DIFFERENTIATING FROM DISEASE**

- **Neglected brood is a condition, not an infectious disease**
- **But it can easily be mistaken for EFB or AFB**
- **key difference is that EFB usually affects worker larvae,**
- **while neglected brood is often isolated to the drones during times of stress.**
- **Are you seeing this pattern in normal drone cells on the edges of the frame,**
- **or is the entire brood nest affected by "bullet-shaped" cappings in worker-sized cells?**



TAKING A SAMPLE OF BEES OF A SUITABLE AGE

For Nosema

Older bees at hive entrance

Suitable container

For Acarine mites

nurse bees around brood nest

Number of bees

30

Why

95% chance of seeing 10% infection

Nosema (aka Vairimorpha)

- **Two types:**
 - **N.apis**
 - **N.cerana**
- **Microsporidian - spore-forming fungus**
- **Directly affects adult bees only**
- **Nosema is a disease of the alimentary system**

Nosema apis signs

Dysentery - but not always and could be something else

Spring dwindling or failing to grow

Summer and early autumn appear to be free of infection - bees defecating away from hive

Winter bee numbers reducing - spores multiplying - bees not defecating outside - spores live in comb - colony collapse



Nosema cerana signs

Dysentery - but not always

No remission in summer

Colony collapse at any time

Nosema effects

Individual

Physiological

**Nutritional and
energetic**

Gland atrophy

Behavioural

Reduced lifespan

Colony

Reduced population

**Decline in foraging and honey
production**

Queen problems

Susceptibility to other stressors

Increased winter/spring losses

•Nosema diagnosis

•In the Field

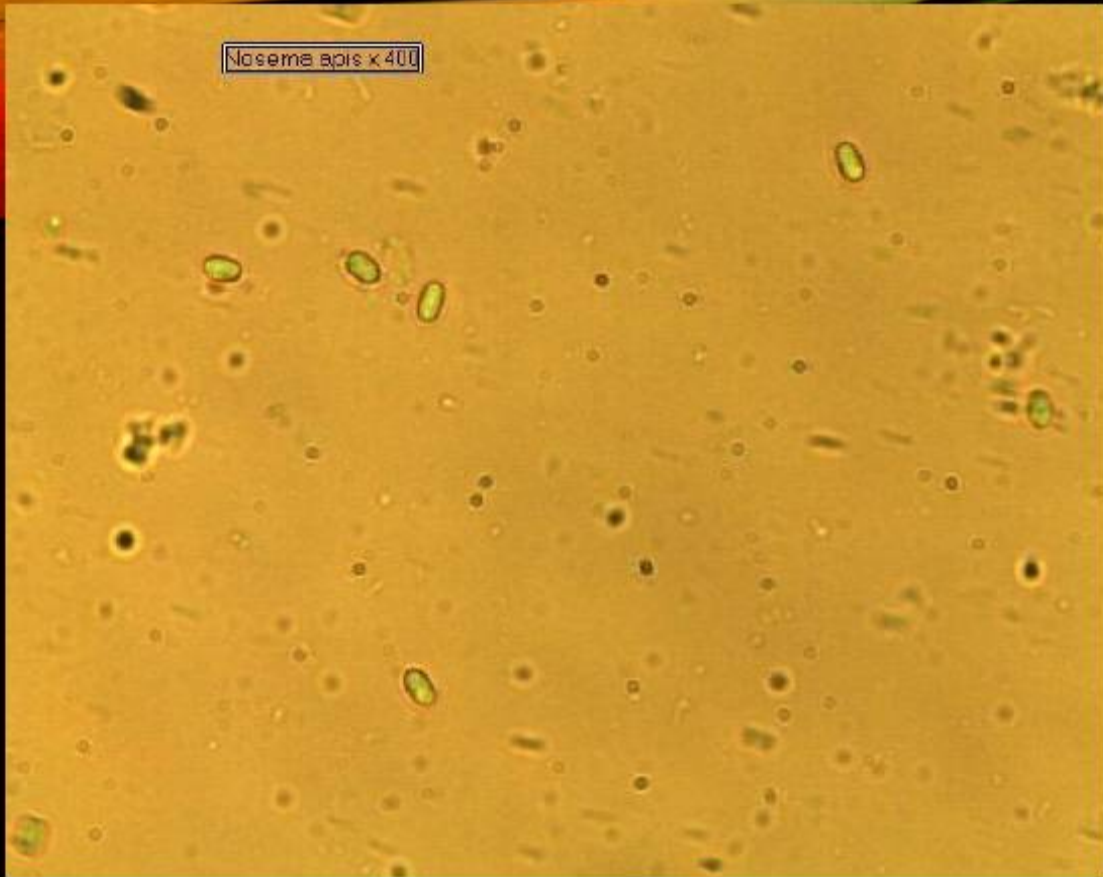
- Take a worker bee and kill it with ethyl alcohol or nail varnish remover
- With pair of tweezers pull out contents of abdomen
- Gut normally yellow/brown has white masses indicating areas of nosema



NOSEMA DIAGNOSIS

- **In the Laboratory**

- **30 freshly-killed forager bees -**
- **Why foragers and why 30?**
- **Crush abdomens in bag or mortar & pestle**
- **Add drop water and mix to make a soup**
- **Transfer a drop to a slide, allow to dry**
- **Examine at x 400 size 5-7 μm**
- **Spores like grains of rice**



Nosema spores x 400

Nosema spores x 1,000



Nosema - treatment

N specific treatment for Nosema but can be reduced by:

strict apiary hygiene,

feeding

comb change to remove the infection in the comb

queen change to more resistant strain

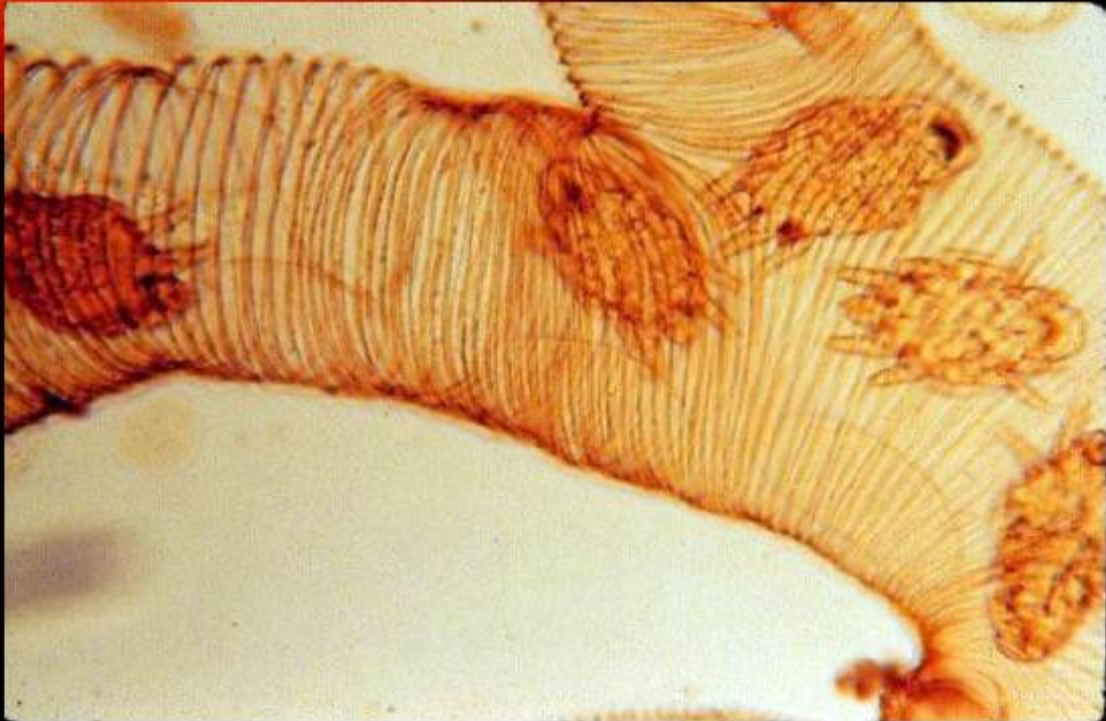
A less stressful method is a Bailey Comb Change for a Weak Colony

ACARINE DISEASE OR ACARIOSIS

- **Condition of adult honey bees**
- **Caused by the microscopic, ectoparasitic mite *Acarapis woodii***
- **Infests the tracheal breathing tubes via the thoracic spiracles in young bees less than 24 hours old.**
- **Sometimes called Tracheal mites**



TRACHEA INFESTED WITH ACARINE



ACARINE - SIGNS

- **Bees cluster in front of the hive**
- **Confused and disorientated**
- **Unable to return to the hive.**
- **'K-wings', where the rows of hooks holding the pairs of the bee's wings together become detached.**
- **Not always seen and can be due to other factors not linked to Acarapisosis**
- **Shorten the lifespan of over-wintering bees**
- **'Spring dwindling' as a result of the winter bees dying early in the spring.**
- **Expanding brood cannot be supported sufficiently by the remaining adult population**
- **Leading to the demise of the colony.**
- **If the colony goes into winter with > 30% infestation the colony is unlikely to survive.**



K-WING

ACARINE DIAGNOSIS

Microscopic examination

**Dissect section of thoracic
trachea**

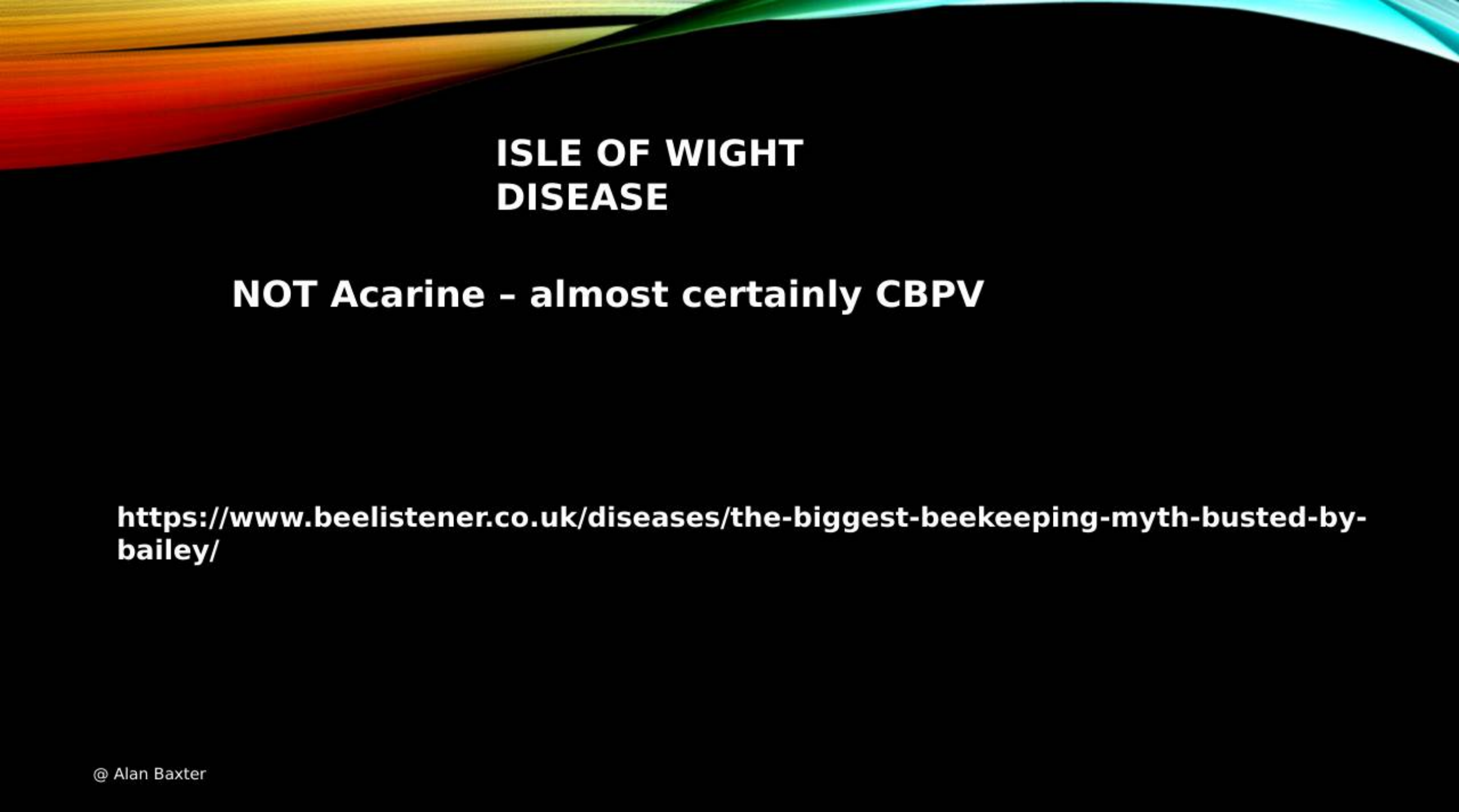
Remove prothoracic collar

Normal trachea appears white

Stain & examine at x 40

**Eggs, larvae and adult mites
visible**





ISLE OF WIGHT DISEASE

NOT Acarine - almost certainly CBPV

<https://www.beelistener.co.uk/diseases/the-biggest-beekeeping-myth-busted-by-bailey/>

•VIRUSES- ADULT BEES

- A number of viruses but the most common are

- Deformed Wing Virus

- Chronic Bee Paralysis Virus



Deformed Wing Virus

Various types

**Vectored by
Varroa**



SESSION 2

Adult bee diseases

Viruses

Nutrition and spray poisoning

Pests:

Varroa

Parasitic Mite Syndrome

Wax moths

Other pests

DWV Signs and Diagnosis

Persists at low levels in infected colonies without symptoms

Healthy bees' immune system is able to cope with it.

When mite populations increase immune system is weakened

DWV causes clinical symptoms in developing pupae

Newly emerged bees deformed wings and bloated, shortened abdomens

DWV - TREATMENT

Currently no direct cure or vaccine for DWV

Management focuses on controlling its primary vector:

Use of IPM to keep Varroa populations low

Hive Hygiene: Regular comb replacement and providing ample space

High-quality pollen can help reduce stress and viral spread.

Requeening: from a line known for "hygienic behaviour" or higher resistance

Emerging Treatments: Researchers investigating antibody treatments and RNA interference (RNAi) technologies to directly reduce viral loads in bees.

<https://pmc.ncbi.nlm.nih.gov/articles/PMC11580425/#:~:text=Varroa%20and%20DWV%20appear%20to,of%20disease%20in%20honey%20bees>

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DWV FURTHER READING

<https://www.nationalbeeunit.com/diseases-and-pests/other-bee-diseases-and-viruses/honey-bee-viruses>

<http://scientificbeekeeping.co.uk/DWV.html>

WATCH

https://youtu.be/NgKRQbFXsKQ?si=_AmeMqlex9nYwkw3

•CHRONIC BEE PARALYSIS (CBPV)

- Severe infectious disease of the adult honey bee**
- Caused by the RNA* single-strand Chronic Bee Paralysis Vi**
- Widespread in Asia, Europe and the Americas**
- Causes very heavy losses of adult honey bees**
- Characterised by piles of dead and dying bees on the ground outside and on hive floor**

*** Ribonucleic acid. Some viruses like Covid-19 use RNA as their genetic material rather than DNA**



Typically presents in two distinct syndromes, which can occur simultaneously in the same colony:

Type 1 (Trembling & Paralysis):

Abnormal trembling or shivering of wings and bodies.

Bees found crawling on the ground or up grass stems, unable to fly

Bloated abdomens (due to a fluid-filled honey sac) and partially spread "dislocated" wings.

Don't react to smoke

Type 2 (Hairless Black):

Bees appear smaller, darker, hairless and shiny

loss of abdominal hairs often caused by healthy bees nibbling at the infected ones

Can fly in early stages

Sign 1

Shivering

Crawling on top bars

Bloated abdomens

Unable to fly

Don't react to smoke

Dead bees on ground and hive floor

Occasionally poo stains on brood box



•Signs 2

- Black shiny hairless bodies - nibbling and rubbing
- Can fly in early stages
- Fighting with guard bees
- Black robber disease
- Dead bees on ground and floor
- Queen superseded



Transmission

Via the faecal-oral route during Trophallaxis

Direct bee-to-bee contact.

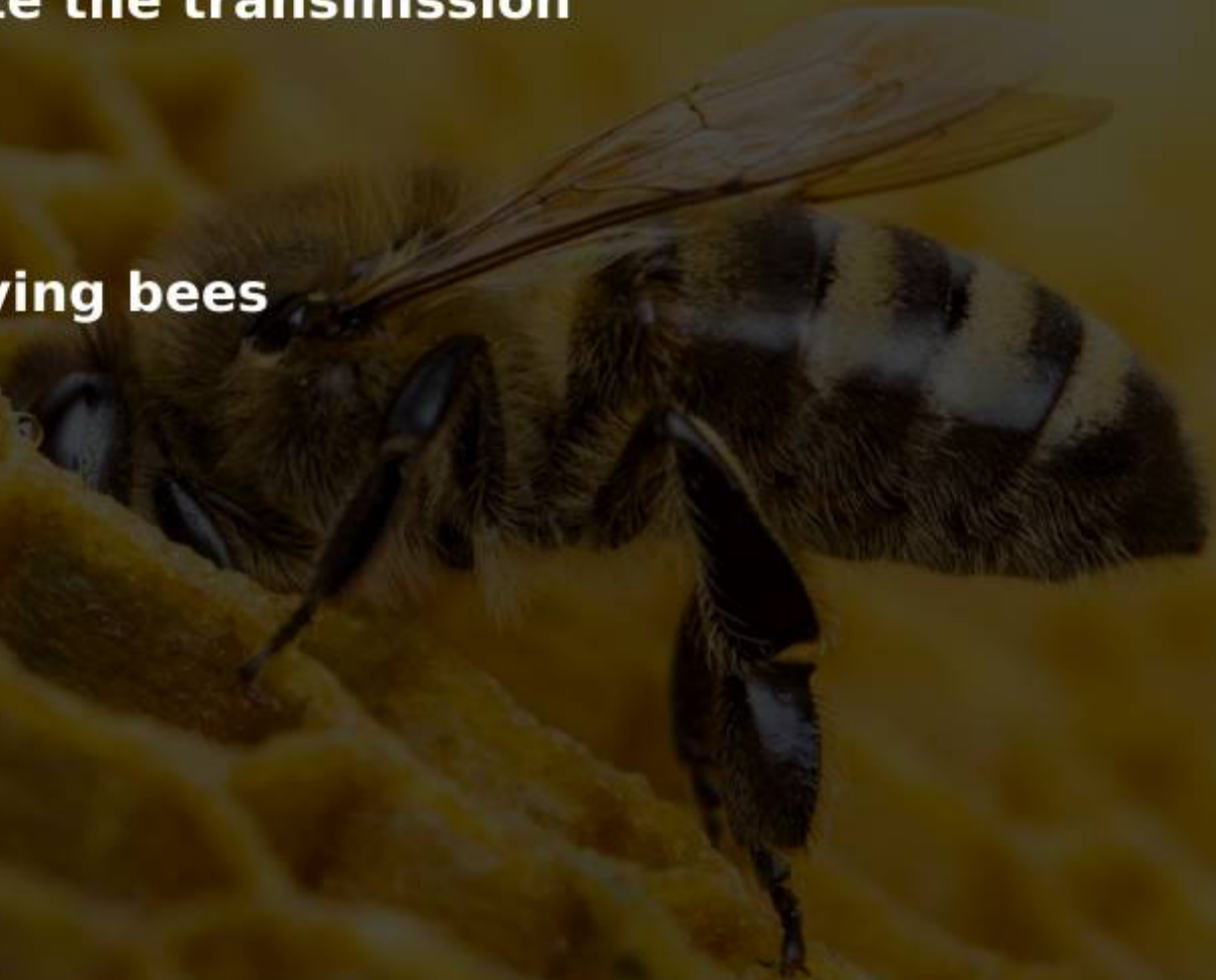
Virus is secreted onto the bee's cuticle and can infect neighbouring bees on contact.

Bees can be infected by injection of the virus and CBPV has been found in Varroa,

No evidence to suggest that the mite acts as a vector.

Management

- Crowded conditions exacerbate the transmission
- Give more space
- Remove and burn dead and dying bees
- Remove poillen traps
- Feed pollen
- Check queen is laying



CHRONIC BEE PARALYSIS SUMMARY

Highly infectious, deadly virus disease affecting the brain and nervous system.

Dead bees still transmit the virus.

Two types often found together.

Strong overcrowded colonies.

Can be in remission

Comes back at a later date

Euthanasia is probably the best option, but decision is agonising



VARROA DESTRUCTOR

@ Alan B. ...

MORPHOLOGY

Length:

Width:

Legs: 6

Colour: reddish-brown

Lifespan:

Number of breeding cycles:



This illustration depicts the life cycle of a bee within a honeycomb structure. The cycle begins with a worker bee entering a cell to deposit an egg. The egg then develops into a larva, which is fed and grows. The larva then transforms into a pupa, and finally, a new worker bee emerges from the cell.

VARROA LIFE CYCLE

- 1. Queen lays egg in cell**
- 2. Day 3 - larva emerges from the egg**
- 3. Day 5 - mother mite jumps into cell and hides in brood food.**
- 4. Day 6 - establishes feeding point on larva. Feeds on
haemolymph including suspended elements of
fat body**
- 5. Day 9 - Cell capped**
- 6. Day 10- first egg laid and male hatches**
- 7. Day 11 -second egg laid and female hatches**
- 8. Day 12 -third egg laid and female hatches**
- 9. Day 14 - fourth egg laid and female hatches**

LIFE CYCLE - CONT

10. Day 15 - Fifth egg laid and female hatches

11. Day 16 - Male mite matures

12. Day 19 - First female mite matures and mates with male

13. Day 20 - Second female mite matures and mates with male

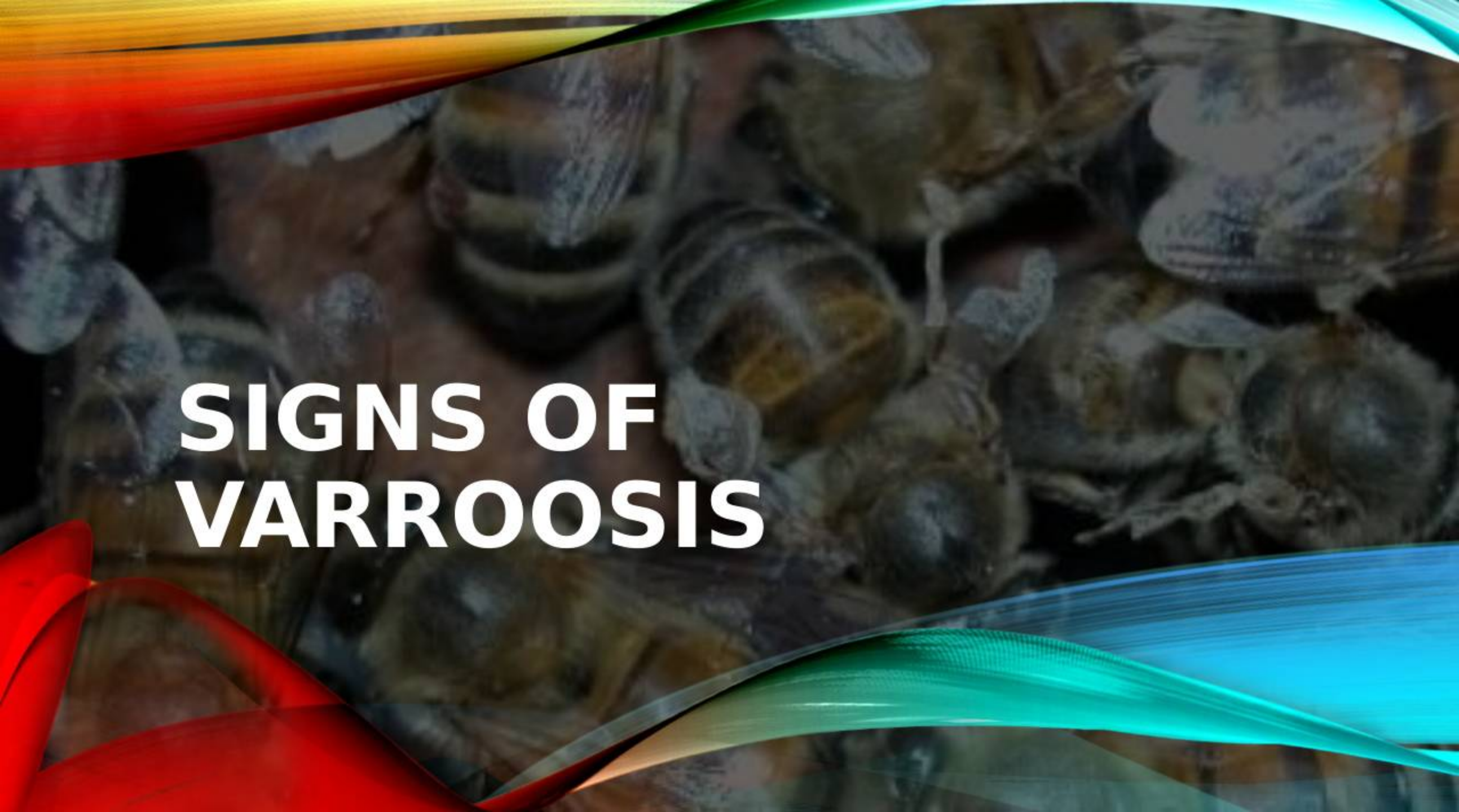
14. Day 21 - Worker bee emerges. Third female and mother mite emerge.

15. Day 22 - Fourth female emerges and mates with male

16. Day 24 - Drone bee emerges. Fourth female and mother mite emerge. Fifth female mite matures.

Male mite and immature or unmated females die in cell.

Varroa spend around 7 days feeding on bees before entering new brood cell or attaching to bees to disperse

The background of the slide features a close-up photograph of several bees. Numerous small, dark, oval-shaped Varroa mites are visible attached to the bees' bodies. The image is framed by abstract, flowing, translucent shapes in vibrant colors: orange and red at the top left, and blue and green at the bottom right.

SIGNS OF VARROOSIS

SIGNS OF VARROOSIS/PARASTITIC MITE SYNDROME

- Perforated cell cappings
- Dead pupae
- Chewed down or cannibalised larvae and pupae
- Neglected brood
- Deformed wings
- Bees with shortened abdomens
- General weakening of the colony
- Patchy/ pepper-pot brood pattern
- Sudden defensive behaviour
- Colony loss.



MONITORING VARROA COUNT IN COLONIES

Non-lethal (allegedly)

- **Sugar roll**
- **CO2**
- **Varroa board drop count**

Lethal

- **Alcohol wash**

SUGAR ROLL



Powdered sugar roll

ALCOHOL WASH



NATIONAL
PROGRAM

Varroa Mite Management



Varroa Mite Alcohol Wash



I have recently become aware of research that shows bees are affected by the procedure and have difficulty in functioning normally afterwards.

Here are some references if you would like to learn more about the research findings:

CO2



d schütteln (es befinden sich etwa 7-8 Liter in einer 16g Patrone), fill the container

METHODS OF TREATMENT & CONTROL

INTEGRATED PEST MANAGEMENT

- **OPEN MESH FLOORS WITH STICKY BOARD**
- **DRONE BROOD UNCAPPING**
- **COMB/QUEEN TRAPPING**
- **ARTIFICIAL SWARM**

The background features abstract, flowing, ribbon-like shapes in vibrant red and cyan colors against a solid black background. The red shape is on the left, and the cyan shape is on the right, both curving and overlapping. The text is positioned in the upper right quadrant, to the right of a thin vertical white line.

OPEN MESH FLOORS AND VARROA BOARDS

OPEN MESH FLOORS (OMF) WITH A STICKY BOARD HAVE THE FOLLOWING BENEFITS:

- **Live mites fall out of the hive and cannot climb back**
- **Dead mites fall out.**
- **This allows you to count the mite drop and estimate the varroa count in the whole colony.**
- **Usually over a period of 7 days.**
- **Identifies chewed out pupa exoskeleton.**
- **Non-invasive**
- **Monitoring all year round**
- **Provides a floor for the colony**

- **VARROA RESISTANCE**

- **THE HOLY GRAIL**

- **DEVELOPMENT OF
VARROA SENSITIVE
HYGEINIC BEHAVIOUR
(VSH)**



SOFT CHEMICALS

Name	Active Ingredients	Effectiveness	Use with supers	When to use	Temp Deg C	Requirements	Duration
Apiguard Thymovar Apilife Var	Thymol	80-90%	No	Summer Autumn	15-30	Solid floor	4-6 weeks
VarroMed	Formic Acid Oxalic Acid	84%	No	Summer Autumn Winter	>3	Access to water	Leave in
Apibioxal Oxuvar Oxybee	Oxalic Acid Trickle or spray	91%	No	Winter/ broodless period	>3	Full PPE Broodless colony	Leave in
Apibioxal Oxuvar Oxybee	Oxalic Acid sublimation	<95%	No	Winter/ broodless period	>3	Full PPE Broodless colony	Leave in
VarroXal	Oxalic acid dihydrate	?	No	Winter/ broodless period	2-10	Full PPE Broodless colony	Leave in

SOFT CHEMICALS (CONT)

Name	Active Ingredients	Effectiveness	Use with supers	When to use	Temp ° C	Requirements	Duration
Formic Pro	Formic acid	90%	No*	Late summer	10-29	Entrances open OMF >6 frames of brood	14-20 days
MAQS	Formic acid	90%	Yes	Late summer	10-29	Entrances open OMF > 6 frames of brood	14-20 days

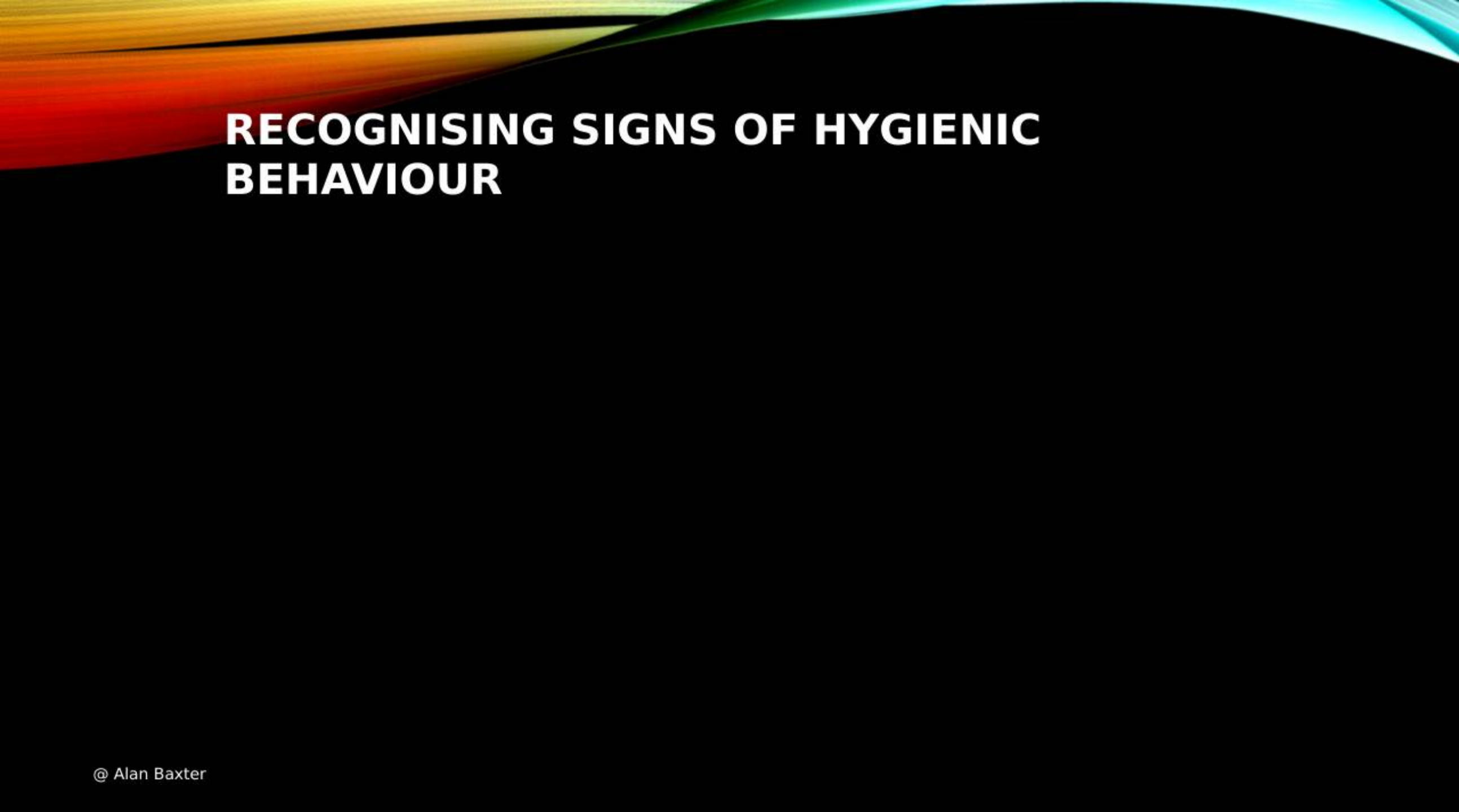
HARD CHEMICALS

Name	Active Ingredients	Effectiveness	Use with super s	When to use	Temp Deg C	Requirements	Duration
Checkmite +Perizin	Coumaphos	90%	No	Spring autumn	>10	Correct disposal	6 weeks
Bayvarol ** Polyvar yellow	Flumethrin	82%	No	Spring/ autumn	>10	Correct disposal	6 weeks
Apistan	Tau fluvalinate	82%	No	Spring/ autumn	>10	Correct disposal	6-8 weeks
Apivar Apitraz Tik Tak	Amitraz	87%%	No	Spring/ autumn	>15	Correct disposal	6-10 weeks

Effectiveness dependent on the presence of resistant

TESTING FOR RESISTANCE - THE BELTSVILLE TEST

[https://www.nationalbeeunit.com/assets/PDFs/3_Resources_for_beekeepers/
Fact_Sheets/Fact_07_Beltsville_and_Pyrethroid_Resistance_Testing.pdf](https://www.nationalbeeunit.com/assets/PDFs/3_Resources_for_beekeepers/Fact_Sheets/Fact_07_Beltsville_and_Pyrethroid_Resistance_Testing.pdf)



RECOGNISING SIGNS OF HYGIENIC BEHAVIOUR

Varroa management;



*Biology
Monitoring
Treatments
Husbandry methods*



varroa Management, a

Kirsty Stainton
NBU Technical Manager



Spring 2023
Convention

Path to varroa resistance in the UK

Prof. Stephen Martin, Clive Hudson, Rhona Toft,
Joe Ibbertson & Steve Riley

TROPILAE PS

- *Tropilaelaps mercedesae*

A notifiable pest



TROPILAEELAPS

- Evolved as parasite of giant honey bees *Apis dorsata* & *A. laboriosa*
- Transited to *A. mellifera* in Asia
- Widespread in South-east Asia
- Confirmed in Georgia and SW Russia
- War in Ukraine ?



Tropilaelaps Morphology

- **Size 1 mm long x 0.6 mm wide**
- **Colour: light reddish-brown**
- **Shape: Elongated**
- **Legs: 4 pairs.**
- **First pair pf legs vertically aligned and modified into antennae-like sensory appendages**
- **Mouthparts that tear when feeding**



TROPILAEAPS -V- VARROA



Tropi Look a-likes

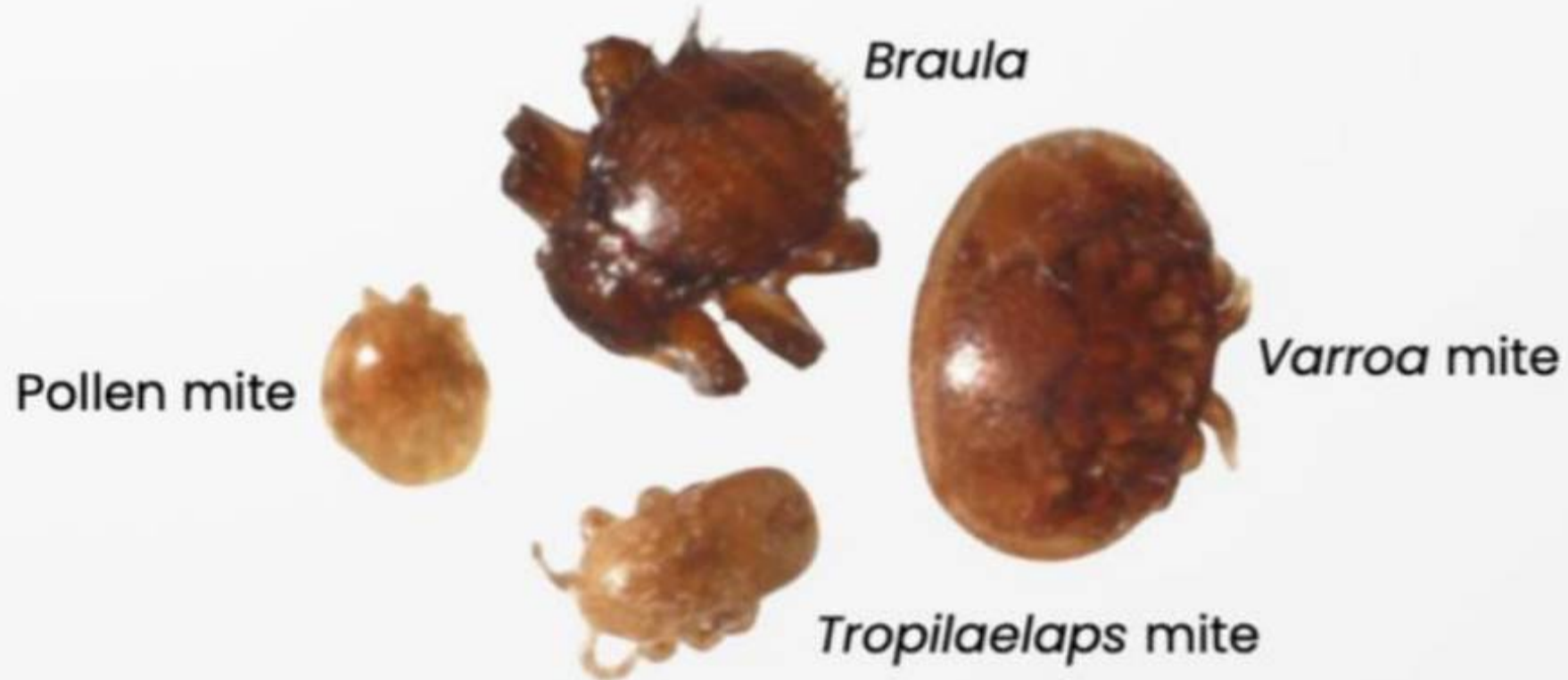


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OIE Terrestrial Manual 2018.

LIFE CYCLE

- **Day 8** After queen lays egg, mite enters cell
 - **Day 10** First trop egg laid and hatches
 - **Day 11** Second egg laid and hatches
 - **Day 12** Third egg laid and hatches
 - **Day 13** Fourth egg laid and hatches
 - **Day 16** First mite matures
 - **Day 17** Second mite matures
 - **Day 18** Third mite matures
 - **Day 19** Fourth mite matures
 - **Day 21** Worker bee emerges with Mother + 4 offspring
-
- **Cf Varroa - only produces average 2.6**

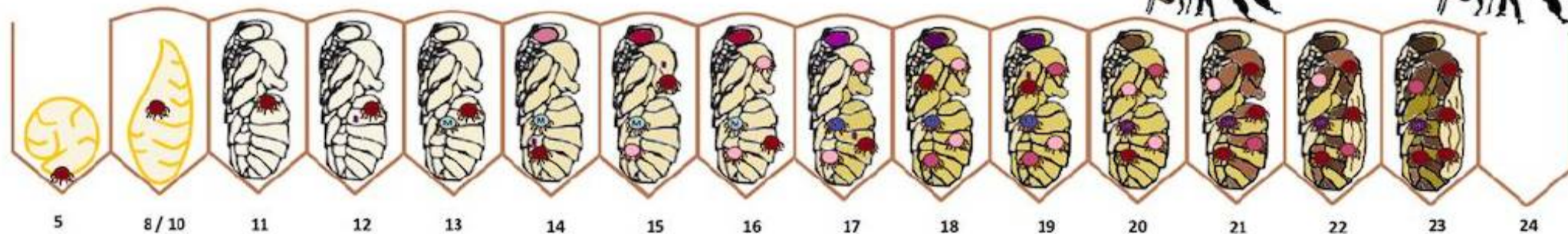


Varroa

Viable mites produced

●● = 1.6

●●● = 2.6

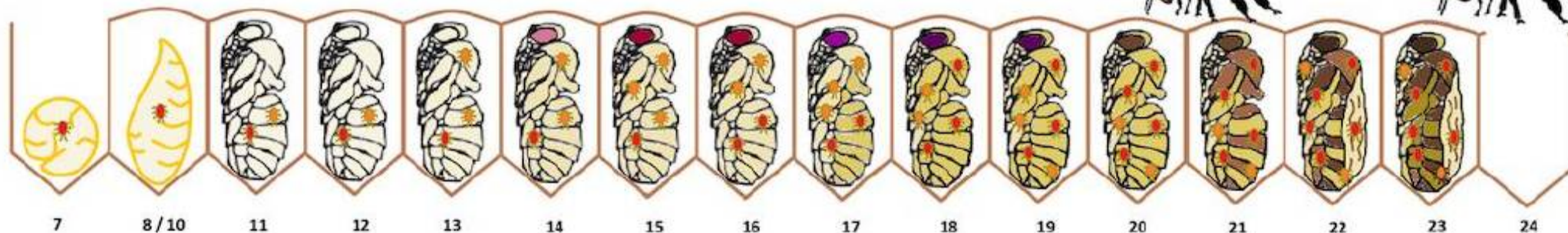


●●● = 3

●●●●● = 4.5



Tropilaelaps spp.



Effects on larva/prepupa/pupa

- **Feed on uncapped and capped larvae**
- **Inflict numerous tear wounds**
- **Usually fatal to brood**
- **Survivors smaller and with shorter lifespan**
- **Vector numerous viruses incl:**
 - **DWV**
 - **CBPV**
 - **ABPV**
 - **BQCV**
 - **SBV – Sacbrood Virus**
 - **CSBV – Chinese Sacbrood Virus**

Effects on Adult Bees

- **Stunted abdomens**
- **Deformed wings**
- **Shortened lifespan**
- **Viruses +++**

FURTHER INFORMATION

https://youtu.be/pxtHOhtIXQI?si=1R4Pym_qf1s2K6d

-

**Any
questions?**



CASE STUDY - HONEY PRODUCING COLONY n° FH8

2023

- **Normal spring build-up**
- **April - varroa test alcohol wash >1%**
- **April - new queen n°7/22**
- **May - 2 supers of spring honey extracted**
- **Mid June had 7 frames of brood 10 seams of bees and 2 supers**
- **Noticed dead bees on ground**



Moved to isolated position

Removed and burnt all dead and dying bees

New clean floor

Empty super to keep unaffected bees separate from dead

New frames of drawn comb checkerboarded with older frames

Feeder thin syrup and pollen supplement

Colony appeared to recover

©24kg honey not extracted, left for bees

2024

April -tested for varroa - >1%

May- Bailey comb change

July - tested for varroa - 3%

Removed 4 supers for extraction, left 1 for bees

Treated for varroa Formic Pro

September- tested for nosema - negative

September- stimulative feeding for queen to lay winter bees

**30 September - 7 seams of bees + 4 frames brood + 4 frames capped stores
+ 1 full super**

7 December - treated for varroa - Oxalic Acid by GasVap

2025

April - Slow spring build-up

Varroa test by CO₂ >1%

Nosema test negative

May - bees fighting at entrance

Dead bees on ground

Bees in brood box shivering

No queen

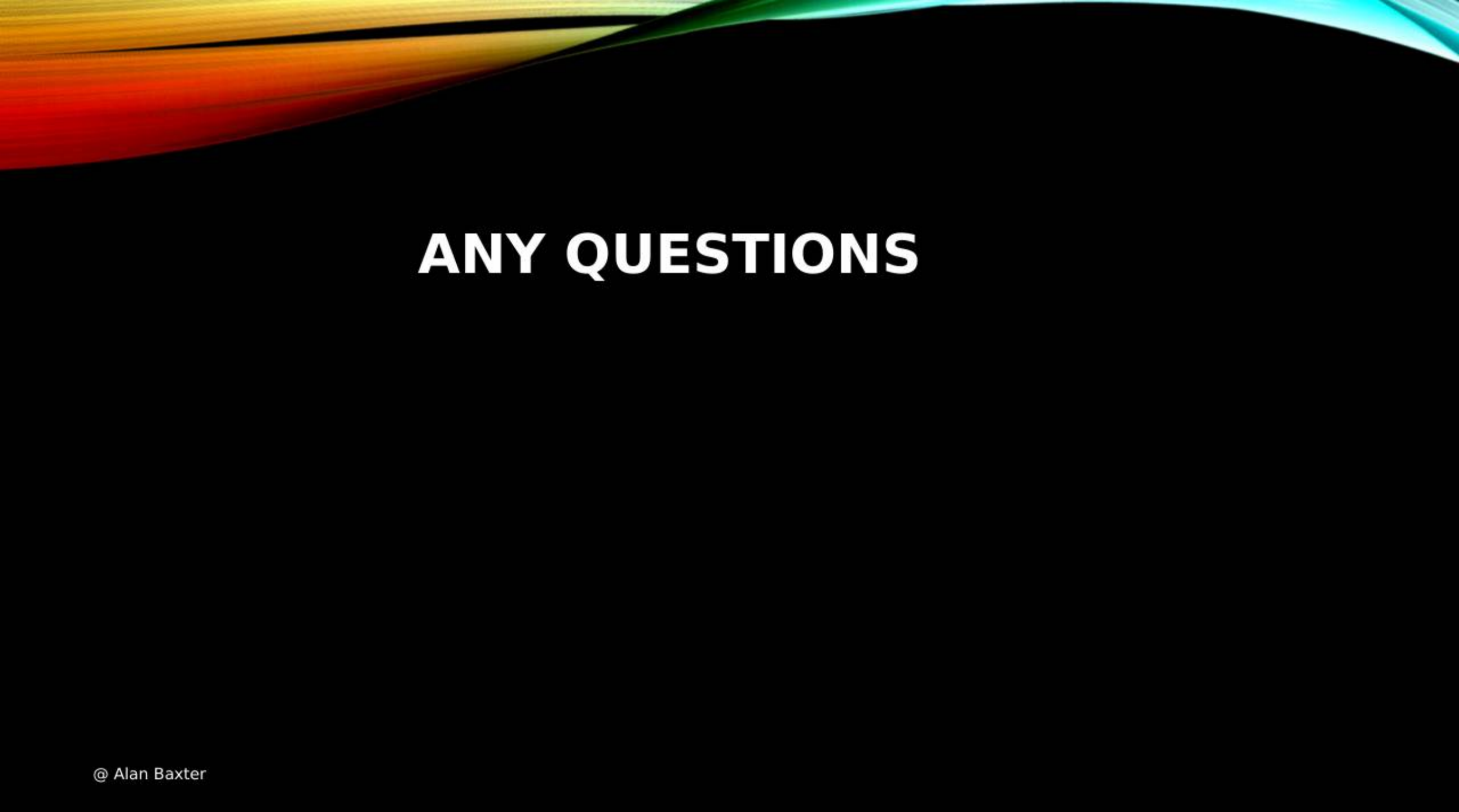
Single supersedure cell

•DECISION POINTS

- Treat as in 2023 and hope it works again
- Risk infecting other colonies by foragers and drones mating
- Euthanize for the greater good of my and other beekeepers' apiaries, and any free-living colonies in the area.

QUESTION

What would you do?



ANY QUESTIONS

BRAULA COECA

Commonly called a bee louse

Wingless fly of the Diptera family

Relatively harmless

Legs have specialized 'teeth' to cling onto its host

Usually lives on a queen's head



MORPHOLOGY



- **Size :** 1.5 mm long and 0.9 mm wide.
- **Appearance:** Reddish-brown, oval-shaped, covered in spine-like hairs.
- **Unique Features:** Unlike most flies, they lack both wings.
- **Legs have specialized comb-like teeth on the feet to cling to the hairs of honeybees.**
- **Identification:** Often confused with the Varroa mite.
- **Braula coeca** has six legs (as it is an insect), while Varroa mites have eight legs (as they are arachnids)



BEHAVIOUR AND LIFE CYCLE

- **Adults** live on the bodies of bees, primarily the queen
- Steal food directly from the bee's mouth during social feeding (trophallaxis).
- **Chemical Camouflage:** mimic the chemical scent (hydrocarbons) of their host colony.
- Females lay eggs in various parts of the hive,
- Only those laid on honey cappings will hatch.
- Larvae burrow through wax cappings,
- **Visible white tunnels** on honeycomb.



Braula coeca management

Most miticides used for *Varroa destructor* also kill *Braula coeca*.

Freezing honey combs at $>18^{\circ}\text{C}$ for 48 hours kills all life stages (eggs, larvae, adults).

Maintaining strong, hygienic colonies prevents infestations.

The process of extracting and uncapping honey removes *Braula* larvae that tunnel under the wax.

WAX MOTH

2 species

Greater Wax Moth (*Galleria mellonella*)

Lesser Wax Moth (*Achroia grisella*)

pests within honeybee colonies.

adults are harmless and do not feed,

**larvae consume honeycomb, pollen,
and bee larvae,**

**leaving a path of silken webbing and
destruction.**



MORPHOLOGY

Greater Wax Moth (*Galleria mellonella*):

- **More common and destructive species.**
- **Adults greyish-brown**
- **Wingspan 30-41 mm.**

Lesser Wax Moth (*Achroia grisella*):

- **Smaller and less prevalent.**
- **Wingspan ~13 mm**
- **Silver-grey with a distinct yellow head.**



LIFE CYCLE

- **Egg (5-8 days):** Females lay 50 to 300+ tiny, white/cream-coloured eggs in small batches within cracks and crevices of beehives.
- **Larva (1-5 months):** Newly hatched larvae burrow into the beeswax, feeding on impurities, honey, and pollen. They are initially white, turning grey/brown and up to 2 cm in length, creating web-filled tunnels.
- **Pupa (3 days-2 months):** Fully grown larvae spin silk cocoons, often on wooden frame components or in the hive body, where they turn into pupae.
- **Adult (1-3 weeks):** Adult moths emerge, mate, and live for about 12-21 days, during which they do not feed.



WAX MOTH TREATMENT

Methods

- Freezing >48 hours at -18degC
- Fumigation with Acetic acid
- Fumigation with Sulphur strips



ACETIC ACID FUMIGATION

Equipment

120 ml acetic acid 80%

Absorbent pads

Respirator if indoors

Gloves

Eye protection

Gaffer tape

Vaseline

Acetic acid damages metal parts

and degrades concrete

Clear area of animals and children

Ensure good ventilation if indoors

ACETIC ACID METHOD

Scrape boxes clean of wax and propolis

Apply Vaseline to metal runners

Stack boxes on a base e.g. pallet

Put plastic dish on the frames of the top box or soak the absorbent pads

Pour 120ml Acetic acid into the dish or soak the pads

Put on an eke or empty super

Add a rood

Seal the joints between the boxes with gaffer tape*

Leave for 7 days

Ventilate the boxes before use. Store outdoors or in unheated space.

SULPHUR STRIPS

Stack the boxes as for Acetic acid

Put one strip in the tin provided

Light with a match or taper

**Leave for 7 days then ventilate and
store outside**

Note

Respirator must be worn

**Area cleared of animals and
unprotected people**



@ Alan Baxter

SMALL HIVE BEETLE

AETHENA TUMIDA

IS IT A THREAT TO UK APICULTURE?

**Once established difficult to
eradicate**

**If it arrives in UK unlikely to be able to
eradicate it**

**Once established it can fly for 10 miles so
spread is rapid**

**Likely method of transmission to UK - trade in bees and
hive products**

BUT

@ Alan Baxter

**Larvae & pupae intolerant of freezing so most of Britain would
be too cold**

MORPHOLOGY - EGG

Size: **Approx 1.4×0.26 mm long x 0.26mm wide. This is smaller than a honeybee egg.**

Colour: **Pearly white.**

Shape: **The shape is described as like a grain of rice.**

Arrangement: **Typically laid in clusters or masses, not singly.**

In strong colonies: **Eggs are usually found in small cracks and crevices of the hive frame.**

© Alan Baxter

In weaker colonies: **Eggs can be laid directly on the brood comb.**

Other locations: **They can also be found in stored pollen and sealed brood.**

MORPHOLOGY - LARVA

SIZE: 1CM LONG

COLOUR: CREAMY-WHITE WITH BROWN HEAD

**FEATURES: 3 PAIRS OF LEGS BEHIND HEAD
DORSAL SPINES**





shutterstock.com · 2138670243



Wax moth larvae

Size: 5-7mm long
2.5 - 3.5mm wide.

Shape : Oval

Features: 6 legs
wings partly exposed
club-shaped antennae



LIFE CYCLE - EGGS

- Female beetles lay eggs in irregular masses within cracks and crevices of the hive, or directly into brood cells containing pollen or bee eggs.

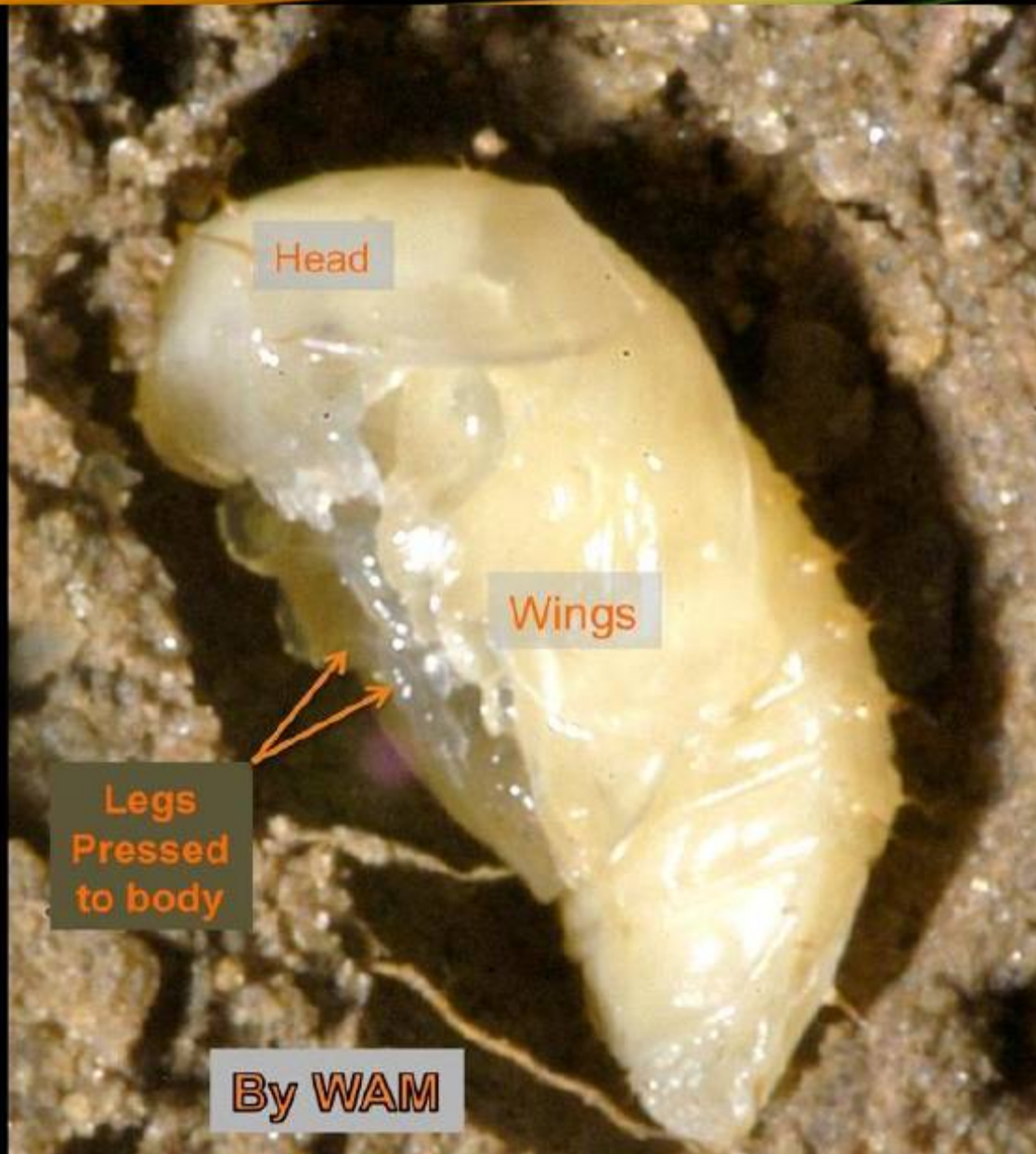


- The incubation period typically between 1 and 6 days, with most hatching within 3 days under favourable conditions

LARVAL STAGE



- 1.Damage:** Most destructive stage. Larvae burrow through the comb, consuming honey bee eggs, brood, honey, and pollen.
- 2.Appearance:** Creamy white with a brown head, grow to about 1 cm (10-11 mm) long, and have distinctive rows of small spines along their back and three pairs of legs near the head. They lack the webbing found in wax moth infestations.
- 3."Sliming Out":** As they feed, the larvae defecate into the honey, introducing a specific yeast that causes the honey to ferment and "slime out," producing a characteristic smell of rotting oranges.



Pupal Stage

Mature larvae burrow into moist soil, typically within a few metres of the hive entrance and at a depth of 5 to 20 cm, to create a pupation chamber.

Successful pupation relies heavily on warm temperatures (above 10°C) and moist soil conditions.

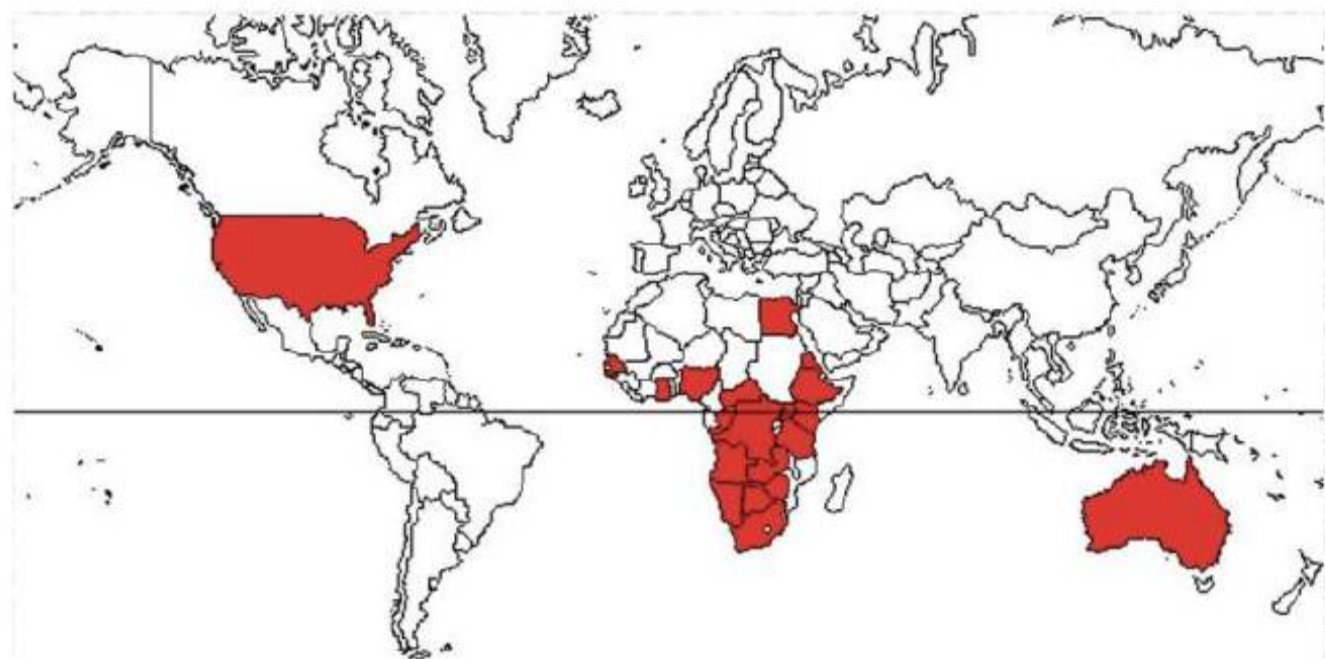
Pupation usually takes about 2 to 12 weeks, but can be as long as 100 days in colder conditions.

Pupae are initially white and darken to brown as they mature.

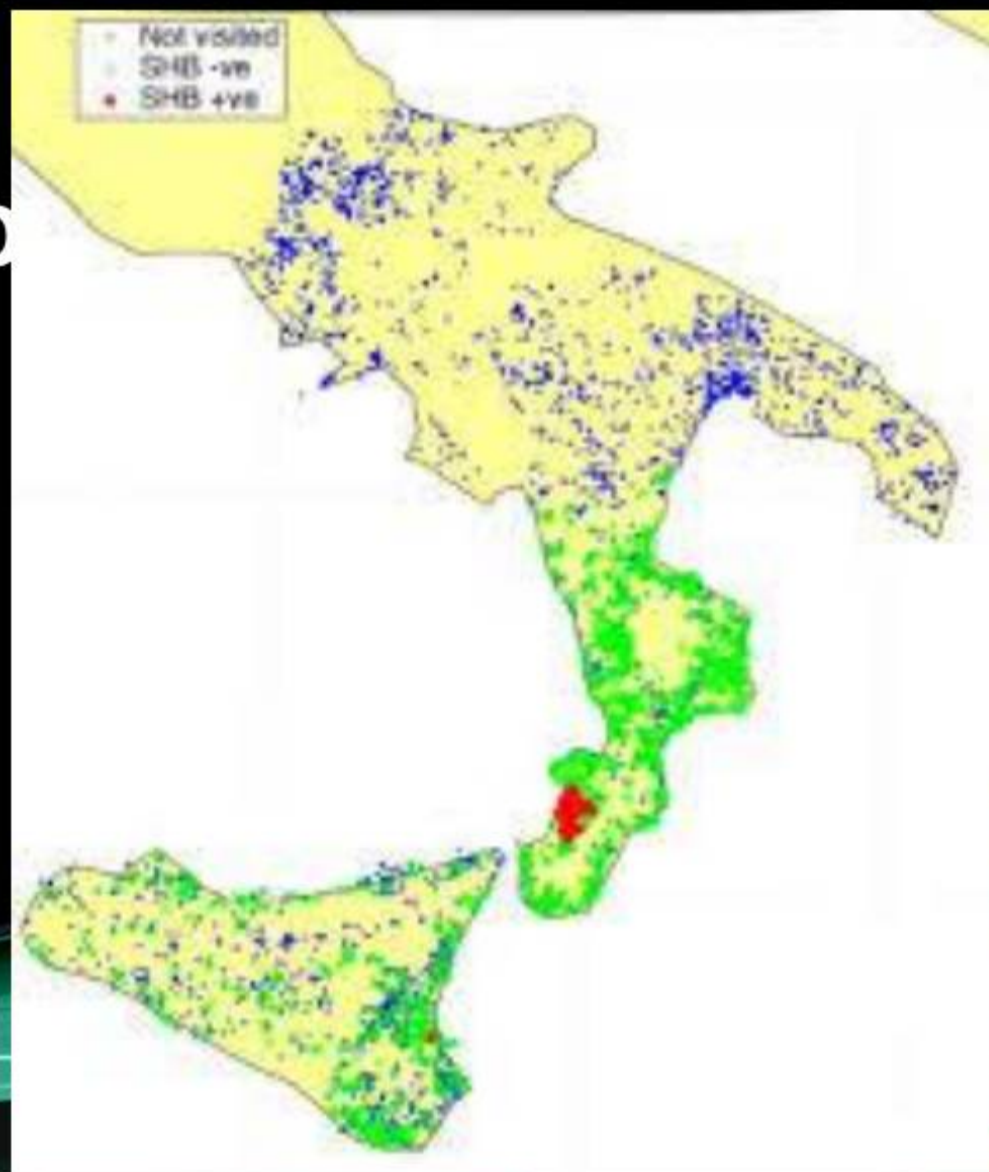


© Alan Baxter

- Emergence: New adults emerge from the soil, initially a reddish brown colour, which darkens to dark brown or black.
- Behaviour: Adults fly in search of new honey bee colonies, attracted by hive odors. They can fly up to 15 km.
- Reproduction: Beetles become sexually mature about a week after emergence and mate within the hive. Females can lay between 1,000 and 2,000 eggs in their lifespan.
- Lifespan: Adult beetles can live for up to six months, surviving the winter within the bee cluster in colder climates.



rio



Treatment options include:

Beetle traps

Diatomaceous earth

Swiffer pads

Freezing infected frames

Maintaining strong, healthy, well-fed colonies

In-hive miticides eg. Checkmite strips with Coumaphos

External soil drenches with pesticides eg Permethrin





PREVENTION

DON'T BUY IMPORTED QUEENS !