

# Bee Forensics

Why is there no uncapped brood in my hive?  
The usefulness of inspection logs

Beekeepers Club

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# About Me

- Hobby beekeeper (3 years)
- 'Cyber'-security Engineer
- I.T. Forensics
  - File system time lines and other log data
  - How Windows systems were compromised

# Outline

- The problem
- What do we know about the hive?
- What do we know about bees?
- Constructing a time line
- Useful log data

# The Problem

- Hive inspection suggests a problem
  - 27<sup>th</sup> October 2018
- Didn't see a queen
- No uncapped brood, very little capped brood
- Colony will die if no queen
  - No brood fresh enough to make emergency queen

# What do we know about the hive?

- Didn't see queen
  - Absence of evidence is not evidence of absence
- No uncapped brood
- Not as many bees as expected
- Not as much honey as expected
- Bees swarmed
  - 14<sup>th</sup> October 2018

# What do we know about bees?

- Need a queen bee to lay eggs and keep the colony alive
- Queen is raised by feeding more royal jelly to newly laid eggs
- Queens are larger than worker/drone bees
  - Need a larger cell – a 'queen cell'

# What do we know about bees?

- Planned queens are raised at bottom of frames
  - Swarming
  - Supersedure
- Unplanned (emergency) queens are raised where the eggs are (generally middle of frames)
  - Accidents
  - Predators

# What do we know about bees?

- Bees swarm
  - Prepare a new queen
  - Swarm 2-3 days before new queen due to hatch
- Brood is capped after around 9 days
- 16 days to make a queen
- Queen is ready to mate after 7-10 days



# Constructing a Time Line

- What are we trying to determine?
  - Should we see uncapped brood on the 27<sup>th</sup> Oct
  - Brood needs a mated queen
- What affects the presence of a queen
  - Swarming
  - Accidents / predators
- Link our known bee facts
  - When can we expect new queen
  - How long before new queen produces brood

# Constructing a Time Line

22 <sup>nd</sup> September	Capped and uncapped brood. Saw queen.
14 <sup>th</sup> October	Swarm
19 <sup>th</sup> October	Capped and uncapped brood. Didn't see queen. Queen cells near top and middle of frames. Free space in bottom brood box.
27 <sup>th</sup> October	No uncapped brood. Some open queen cells (one in middle).

- Start with hive inspection log data
- Add known events and times
  - Swarm on 14<sup>th</sup> October

# Constructing a Time Line

22 <sup>nd</sup> September	Capped and uncapped brood. Saw queen.
14 <sup>th</sup> October	Swarm.
17 <sup>th</sup> October	New queen.
19 <sup>th</sup> October	Capped and uncapped brood. Didn't see queen. Queen cells near top and middle of frames. Free space in bottom brood box.
23 <sup>rd</sup> October	Last uncapped brood from old queen.
27 <sup>th</sup> October	New queen mated.
27 <sup>th</sup> October	No uncapped brood. Some open queen cells (one in middle).

- Use bee facts to calculate and add other events and dates
- Bees swarm 2-3 days before new queen expected to hatch
- Queen will mate 7-10 days after hatching
- Brood capped after 9 days

# Constructing a Time Line

22 <sup>nd</sup> September	Capped and uncapped brood. Saw queen.
01 <sup>st</sup> October	Replacement queen laid
04 <sup>th</sup> - 11 <sup>th</sup> October	Emergency queen laid
14 <sup>th</sup> October	Swarm.
17 <sup>th</sup> October	New queen.
19 <sup>th</sup> October	Capped and uncapped brood. Didn't see queen. Queen cells near top and middle of frames. Free space in bottom brood box.
23 <sup>rd</sup> October	Last uncapped brood from old queen.
27 <sup>th</sup> October	New queen mated.
27 <sup>th</sup> October	No uncapped brood. Some open queen cells (one in middle).

- 16 days to raise a queen
  - Emergency queen could have hatched between 19<sup>th</sup> and 27<sup>th</sup>

# Why Log Data?

- What do we want to be able to determine?
- How the bees are doing (management)
  - Are their food supplies increasing / decreasing?
  - Is the queen laying more / less eggs?
- Cause and effect (management)
  - Why things went badly / well
  - Can repeat good effects and not repeat bad effects

# Why Log Data?

- Traceability
  - Bee disease / pests (Biosecurity Act / health)
  - Human health (Food Safety / Health regulations)
  - Knowing when your hives / honey were / weren't affected can help authorities trace the source
- Planning
  - Does the data suggest that they swarmed?
  - When did they swarm last year?
    - Need to sort them out before similar time this year

# Useful Log Data

- Which hive
- Configuration of the hive
  - Number of brood boxes
  - Number of supers
  - Presence and location of queen excluder
- Type of check
  - Full check / honey check / brood check

# Useful Log Data

- Presence of brood
  - Capped
  - Uncapped\*
- Presence of pollen
- Presence of honey
  - Capped
  - Uncapped
- Sighting of queen
- Presence and location of queen cells\*



# Useful Log Data

- Presence of pests (useful for DPI)
  - Small hive beetle
  - Wax moth
  - Varroa mite
  - Other
- Presence of disease (useful for DPI)
  - American foulbrood
  - European foulbrood
  - Chalkbrood

# Useful Log Data

- Maintenance
  - Moving hives (DPI)
  - Pest / disease checks (useful for DPI)
    - Sugar shaking
    - Brood test
  - Adding/removing boxes/queen excluders
  - Feeding
- Any other changes
  - Experiment, observe results, keep detailed notes

# Useful Log Data

- Honey extraction
  - When
  - From which hive (and which frames?)
  - How
  - Assign an identifier (batch number)
    - Can identify other honey which may be affected
    - Which batch was given to whom (for notification)
- Weight of the hive / boxes
  - Rough indication of amount of honey

# Tricks and Tips

- Keep a log of hive inspections
  - Check DPI / Biosecurity Act requirements
    - hive movement / sales
  - Logging the negative can be just as useful as logging the positive
    - What you didn't see
    - What you didn't do / check / look for
- Read your log data!
  - Checking my inspection log data for previous season showed a similar pattern of behaviour

# Tricks and Tips

- Use unique identifiers (number / name)
  - Hives
  - Frames
    - If doing proper biosecurity separation, include hive id
  - Honey extractions
    - From the same collection of frames from the same hive
    - Include hive id
      - <number><hive> (0001A, 0002A, 0003B, 0004A)
  - Other equipment
    - If doing proper biosecurity separation include hive id

# Summary

- Not seeing uncapped brood 13 days after swarming may not be cause for concern
  - You'd want to see it not long after 13 days though
  - We saw uncapped brood on 11<sup>th</sup> Nov inspection
- Keeping a log of your hive inspections is useful
  - Management
  - Biosecurity Act
- Think about what information you need to log
  - Then look for it
  - Will come with experience

# Bee Curious

- Lot of experience in the club
  - We were all bee-ginners once
- DPI also have a lot of info
  - Prime Facts
  - Books / eBooks
- Questions?
  - Preferably ones that I can answer
- Useful links
  - <https://www.dpi.nsw.gov.au/animals-and-livestock/bees>