Cheshire Beekeepers' Association
South Cheshire Branch

Technology in Beekeeping

Tue 2026-10-20 October Branch Meeting
Presented by Arwel Barrett and Nathan Morgan

Abstract: Technology in Beekeeping

Technology can help us look after bees, so they can look after us.

- Discover how blockchain technology is used in the supply chain to guarantee authentic real honey.
- Hear how digital assistants and chatbots are used to make inspections easier and more efficient for beekeepers.
- Learn how we use information collected from smart hives to gain insights, make decisions, take more effective actions.



Agenda: Technology in Beekeeping

Smart Labels

- Blockchain

Smart Inspections

- Digital Assistants / Chatbots

Smart Hives

- IOT (Internet of Things)
- Predictive Analytics



1. Smart Labels

- Verify real natural honey made by honey bees, not fake honey "adulterated" with cheap sugar syrups in a factory. Investigations show that a high percentage of honey sold fails authenticity tests cheating buyers.
- A "Blockchain" stores data. Each new block links to the old block using secret codes forming a secure chain. No one person owns it; instead, many computers share a copy of the list.
- Use blockchain to establish an eco-label "Bee Mark" to guarantee produce is authentic from ecologically sustainable sources. Capture evidence from all parties though the supply chain.

https://worldbeeproject.org/2020/06/11/the-world-bee-mark/

https://my.apilog.app/honey-profile/byleybees/cmt2mlg0r000004kwszpehmmv



Breakfast Directive

- European Union regulations took effect 2026-06-04 EU 2024/1438
- Improve labeling, ingredient quality, and consumer transparency for honey, fruit jams, fruit juices, and dehydrated milk
- Aim to prevent food fraud, reduce sugar content, and help people make healthier choices.
- For example, generic phrases like "blend of honeys" no longer acceptable.

  Honey labels must list every country of origin in descending order by weight including the exact percentage.

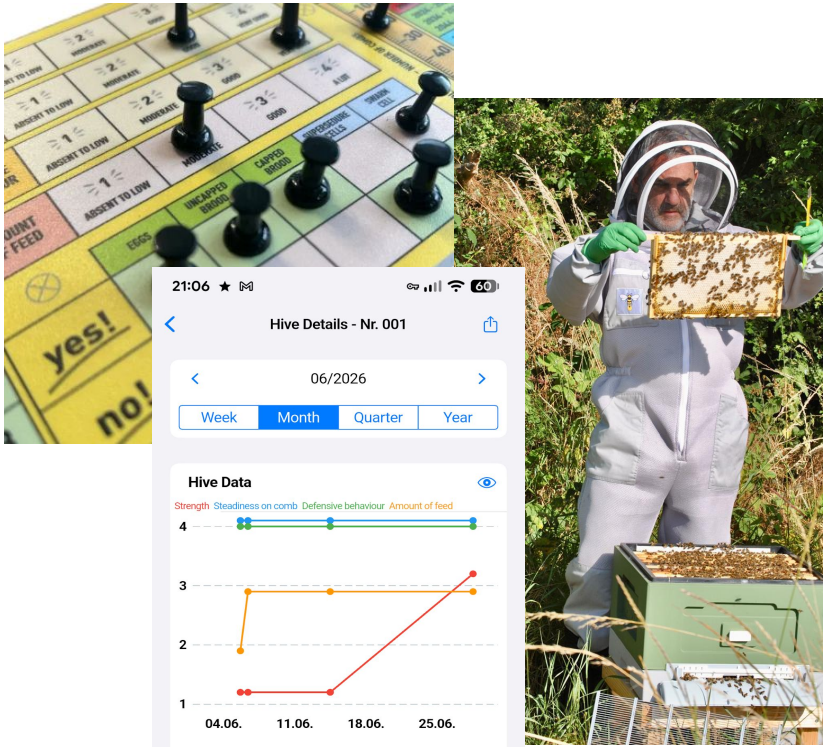


"Clear Origin, Clear Choice"

2. Smart Inspections

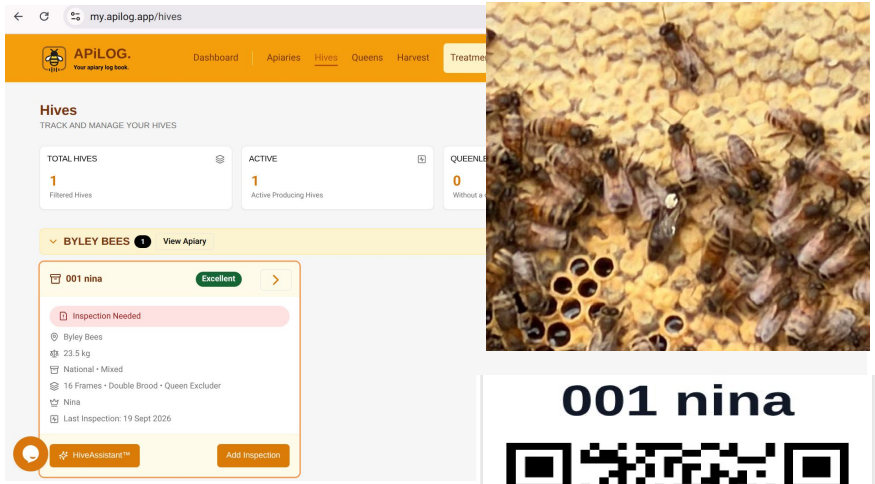
- Pin Cards used to capture inspection results.
- Take a picture with the app on your phone to quickly capture the results of each inspection online.
- For example, Pin-Stock-Carte (PSK)

  https://stock-karte.de/en-gb/products/pin-stock-karte-nkl-pins-und-schrauben



Example: APiLog Beekeeping Assistant

- Tools to document hive inspections, feeding, treatments, harvests.
- Capture inspections with your voice using “hands-free” digital assistant.
- Chat with a bot mentor whom answers your questions and makes suggestions based on your history.
- Get up-to-date weather forecasts and pollen count data for each location.
- Shareable Honey Profile with batch details, floral source. Customers scan the QR code on the jar to see the story behind their honey.

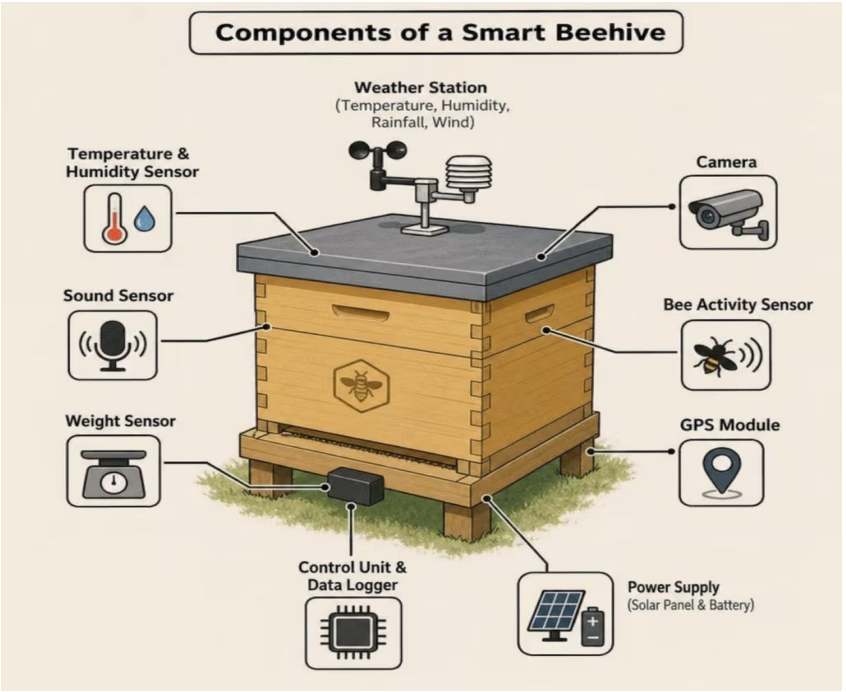


My Hive “Nina”
https://my.apilog.app/hives/cmgn8ikne000004jmna30zlq2



3. Smart Hives - Internet of Things (IOT)

- Smart hives fitted with sensors to collect and transmit biometric and environmental data.
- Measure metrics including temperature, humidity, weight, acoustics, light, gas (CO_2 etc.).
- Analysis of data with machine learning algorithms and data visualisations.
- Real time continuous monitoring with automated alerts. If thresholds are exceeded then send alerts to beekeepers to take action. For example, temperature 30 to 36 degrees celsius.



World Hive Network

World Bee Project

"nature and people-based solutions to address pollinator and biodiversity loss and the climate crisis."

World Hive Network

50,000 intelligent hives

2.5 billion bees!

https://worldbeeproject.org/2020/12/08/world-hive-network/

https://youtu.be/GDw87QePaBw?si=sWoIlP4EO6o0F4nY

https://www.beehero.io/beekeeping-solutions

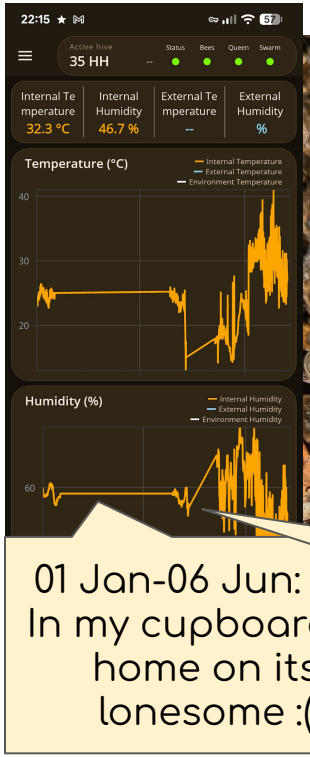


When Bees Thrive, We Survive: The World Bee Project (2:02)
https://youtu.be/L4CFpXhdE1Y?si=QjSHcjmtUe5iB0ca

Example: Hive Heart - Hive Monitor

Hive Heart

- Free mobile app for iPhone and Android. Download data from hive monitor to phone using bluetooth.
- Battery included. Life ~1 year.
- Measures (every 10 minutes)
  - Internal Temperature (℃) and Humidity (%)
  - Sound Frequency (Hz) and Amplitude (dB)
  - Swarming Forecast and Loss of queen alert





01 Jan-06 Jun: Sat In my cupboard at home on its lonesome :(

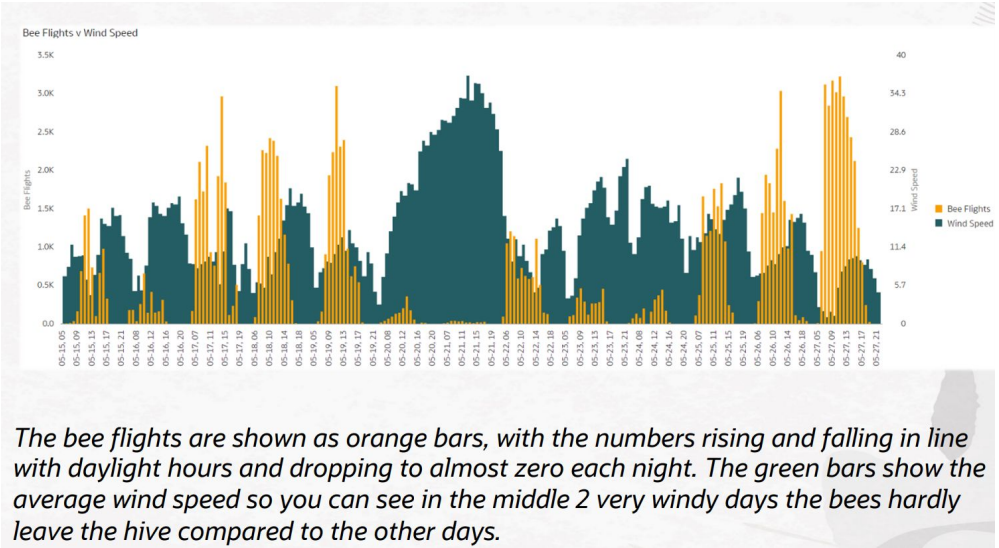
2026-06-03: Got my nuc from Buckley Bees!

Example 1: Flight Paths

- For example, video recognition to monitor waggle dances to understand where bees are travelling to gather resources (Water, Nectar, Pollen, Propolis).

https://worldbeeproject.org/2026/06/26/how-to-track-the-flight-patterns-of-bees/

https://worldbeeproject.org/2021/11/01/oracle-reading-university-berryworld-farms/



The bee flights are shown as orange bars, with the numbers rising and falling in line with daylight hours and dropping to almost zero each night. The green bars show the average wind speed so you can see in the middle 2 very windy days the bees hardly leave the hive compared to the other days.

Technical Brief (F60034_01)
https://docs.oracle.com/en/programs/research/world-bee-project/F60034_01.pdf

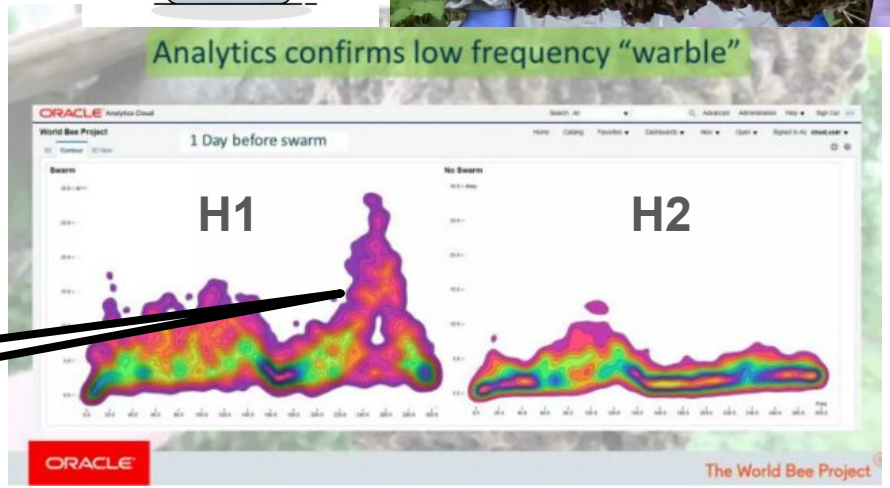
Example 2: Swarming

- Analysis of acoustic data to predict behaviour “swarming”.
- For example: 2 hives; heatmap of
  - Colour = volume (dB)
  - Y axis = frequency (Hz) high to low
  - X axis = time (over 21 days)
- Q: Which hive is swarming?

  H1 (Left) or H2 (Right)







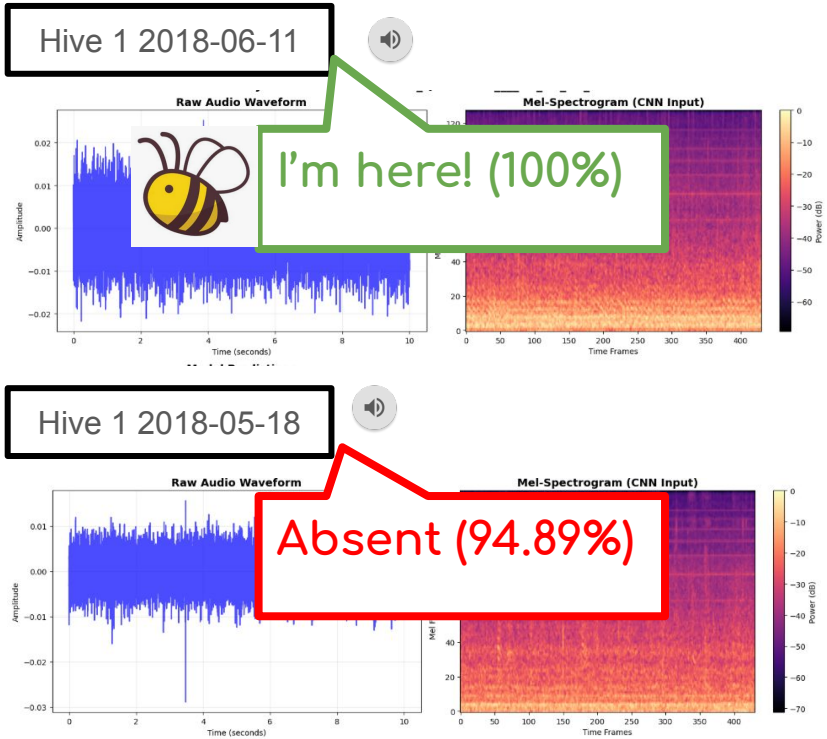


H1 is swarming!

NOTE: A low frequency “warble” may indicate a risk of swarming.

Example 3: Queen Bee Detection

- Analysis of acoustic data to detect if a queen bee is present or not.
- For example, using a deep learning Convolutional Neural Network (CNN).
  - Input data set of audio recordings (6.11 GB). Data analysis using Python. Audio converted to spectogram images (easier for model to analyze). Model trained on 4000 hive recordings + 2000 external noise (bike etc.). Models pass data through a series of layers (filters). 10 epochs. Pick best model.
  - Evaluate model with validation and testing data. Excellent performance with an overall accuracy of 99%. Both classes "absent" and "present" high precision with very few false positives, high recall with nearly all relevant instances correctly identified, and balanced performance with consistent metrics across both classes, confirmed by the macro and weighted averages.



https://www.kaggle.com/datasets/harshkumar1711/beehive-audio-dataset-with-queen-and-without-queen

Example 4: “Build the Buzz”

- BBKA national educational campaign “Build the Buzz” (2014)
- Hive monitoring equipment from Arnia Ltd (Dissolved 2022).







Equipment

- Arrived July 2016
- Stand & weigh scale plate





Equipment

- Stand & weigh scale plate
- Brood box
- Queen excluder
- Supers
- Crown board & roof
- Arnia Gateway



Equipment

- Stand & weigh scale plate
- Brood box
- Queen excluder
- Supers
- Crown board & roof
- Arnia Gateway
- Weather station



Equipment

- National hive scale
- Monitoring sensors





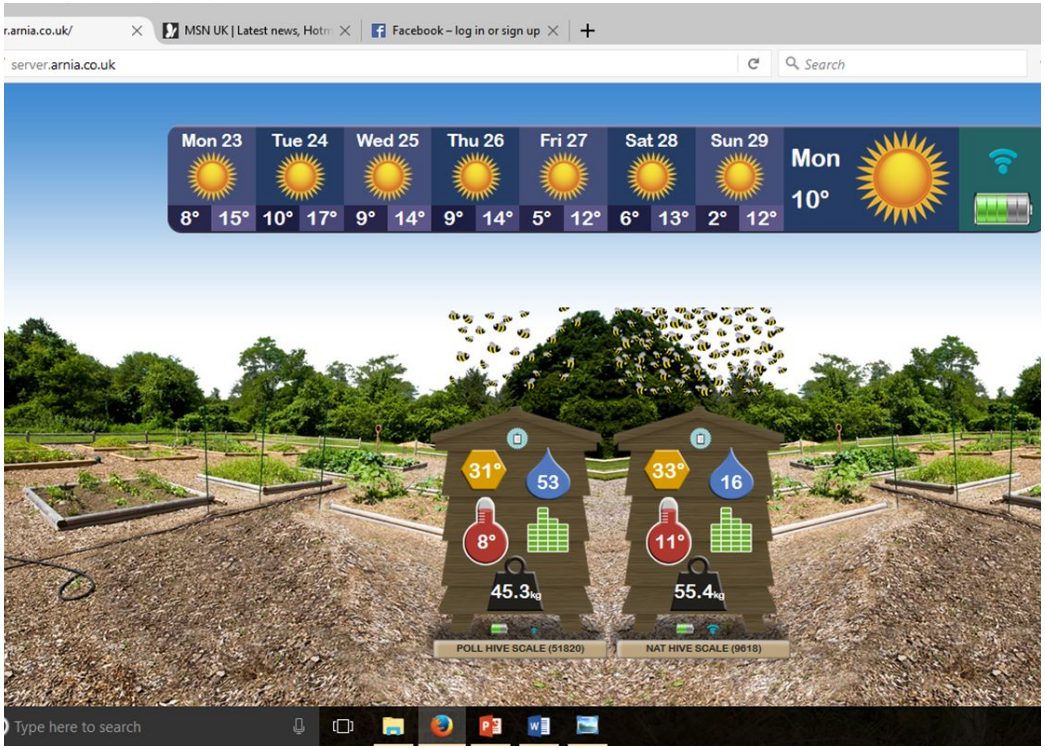
Equipment

- National hive scale
- Monitoring sensors
- Comms to Arnia Gateway



Monitoring Data

- Hive weight
- Brood temperature
- Brood box relative humidity
- Shade temperature
- Direct sun temperature
- Cumulative rain fall



Case Study



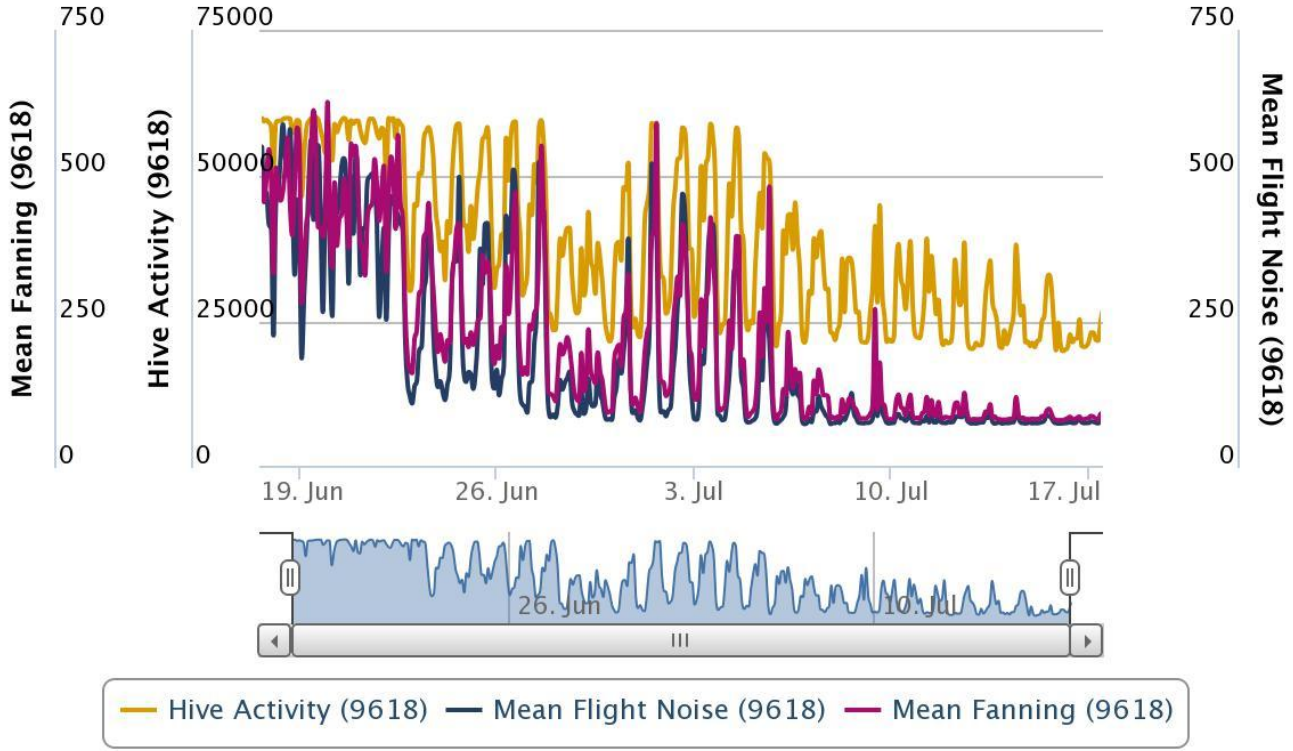
Case Study



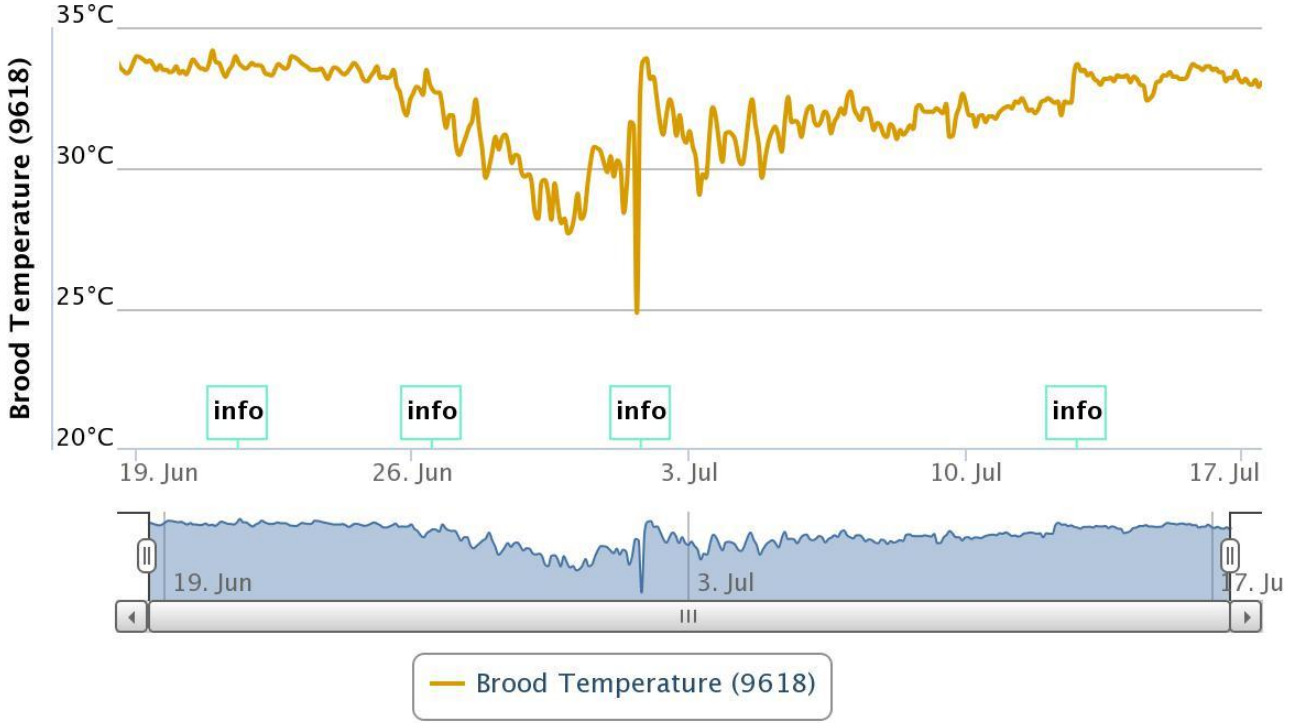
Case Study
Weight



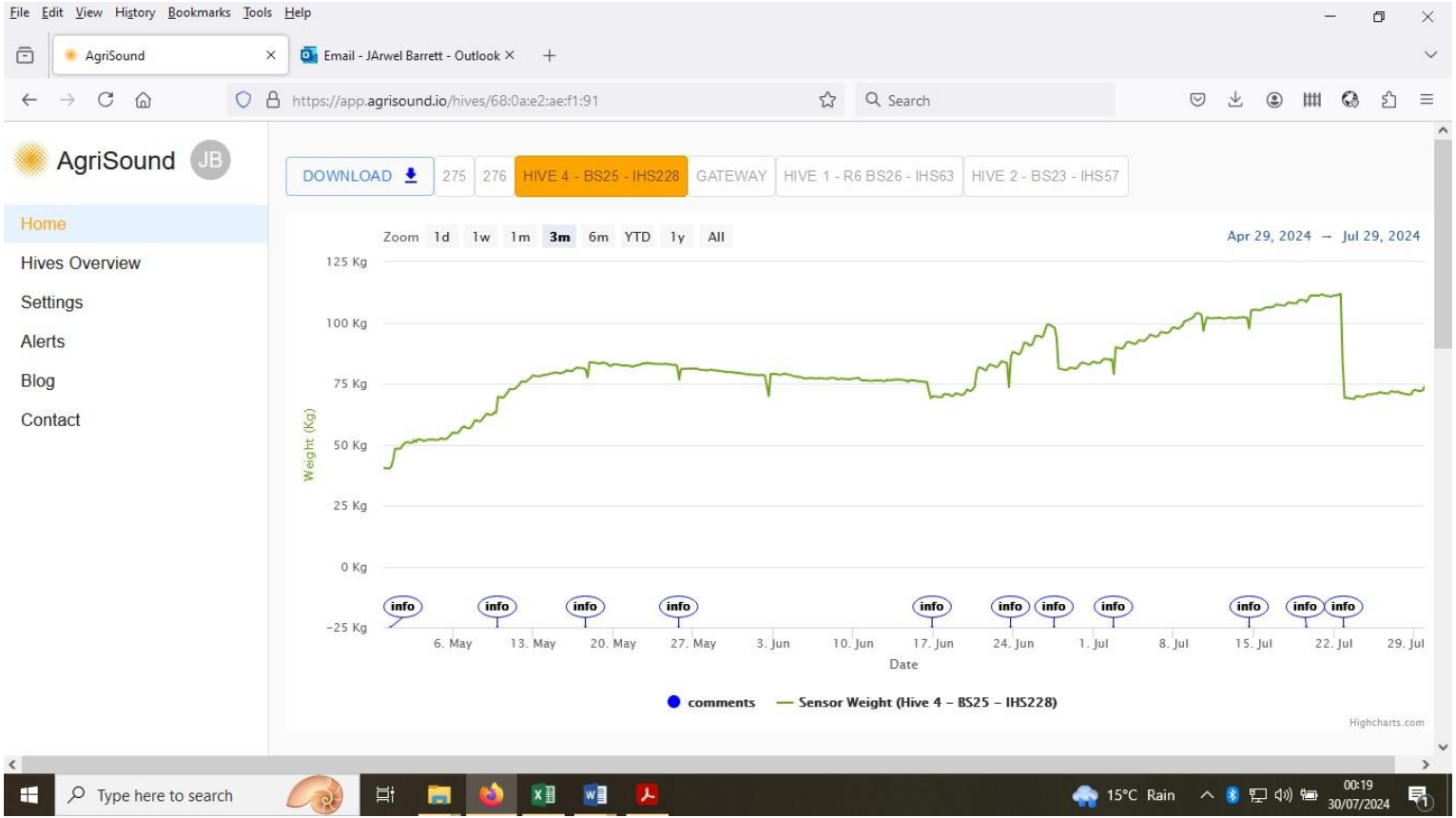
Case Study
Acoustic



Case Study
Brood Temp



1. Weight (Hive 4)



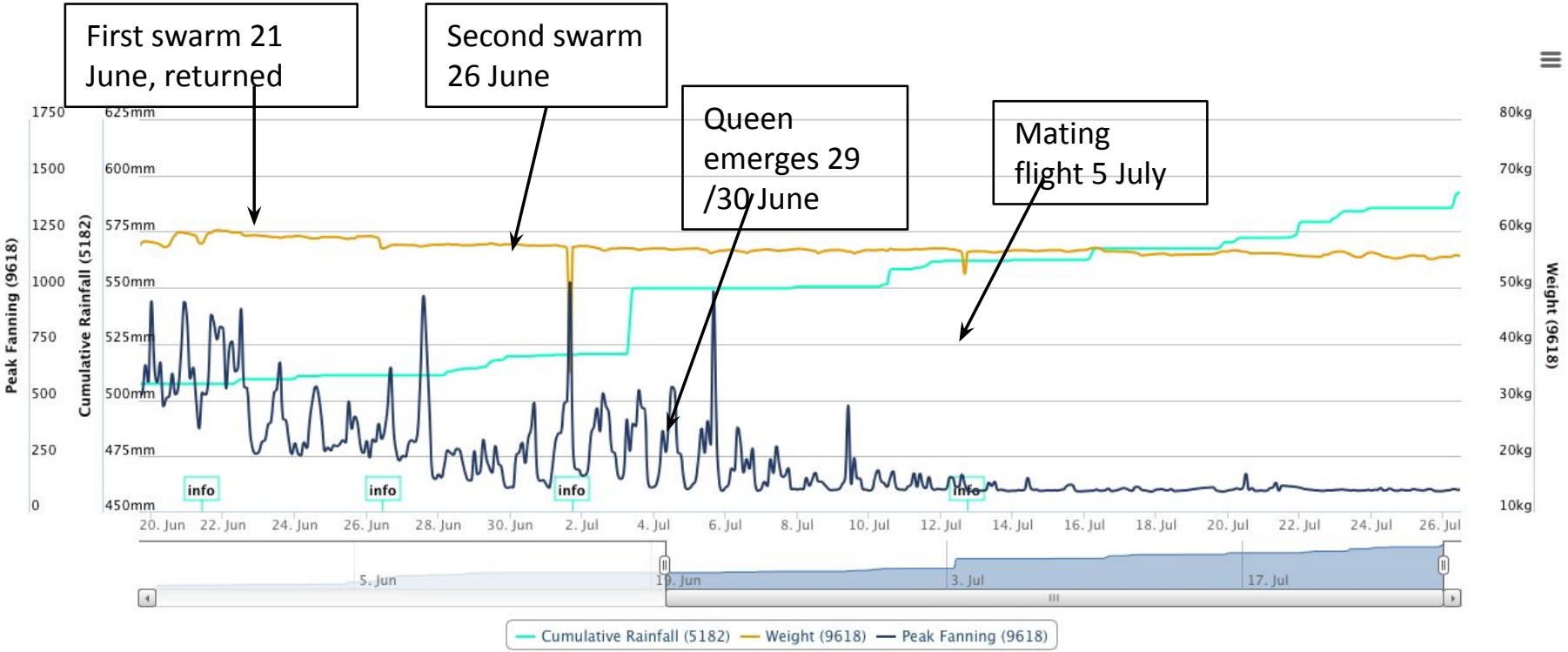
2. Weight (2018-12-25)



3. Weight (2019-04-26)

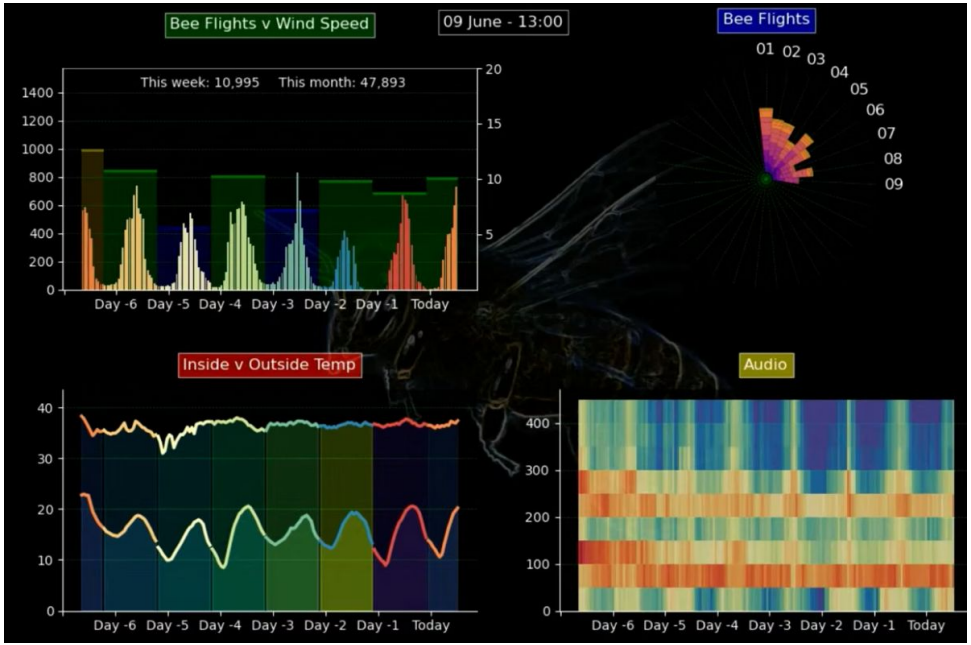


4. Weight, Rainfall, Fanning



QA: Questions and Answers

Thanks for listening!



https://vimeo.com/764479290/20244ca790?fl=pl&fe=sh