Saving the Bees with Maths
and Dr Laura Jones

About the Scientist

Dr Laura Jones is a scientist at the National Botanic Garden of Wales. She is working on projects which use DNA to monitor, maintain and restore biodiversity, from the level of individual plants to whole habitats. Laura has carried out a lot of research that can be used to help save the bees! She is very passionate about the conservation of plants and pollinators.

Laura's doctoral research investigated the foraging preferences of the honeybee by using DNA metabarcoding, a method of identifying DNA within a mixed sample. This was used to identify which plants the UK honeybees used when making their honey. The plant DNA present also revealed the types of habitat that UK honeybees have been using most for foraging.

Flowerpot Podcast Episode
With Dr Laura Jones

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Dr Laura Jones told MSPW:

"Maths has helped me solve problems, discover trends, and understand the world around us. With maths we can take our research questions from 'we think' to 'we know'."

A Square number!

441 Honey Samples

Changes in Bee Foraging

This research found that white clover is a dominant source of nectar/pollen for honeybees.
In recent years there has been **a 27% decrease** in flowering white clover present in managed grasslands, this is due to:
- Decreased use of clover in crop rotation
- Increased application of inorganic nitrogen fertilizers
- Herbicides
- Intensive grazing or trimming, preventing flowering

Though there has been a drop in the number of flowers present, white clover was still the second most abundant DNA found in the honey, meaning that the bees are seeking it out.

The Maths Behind Honey

In her research, Laura has used multiple mathematical techniques to quantify the DNA data and create graphs.
- **Frequency** of plant pollen species occurring within honey
- Habitat defined in a region by its **radius** from the hive
- **Correlation coefficients** in sample analysis, which was used to **measure** the strength of the relationship within **variables**
- **Graph averages lines** compared to **analyse correlations** within data from Laura's survey in 2017 and the UK honey survey in 1952

Laura's research quality was proven to be reliable by showing a **positive correlation** between the composition of habitats in the UK and the **proportion** of the habitats within a 2 km **radius** of the beehives.
This meant that the honey samples were a good representation for the UK.

What plants do Honeybees like best?

The honey DNA showed that since the last survey in 1952, brambles have now become the leading source of nectar for honeybees. Brambles have similar flowering seasons to white clover, both providing pollen and nectar, but this substitution may not be providing the bees with the same nutritional benefit. The protein content and amino acids is lower in brambles, essential for healthy bees!
Check out the graph from Laura's research to see more about how the pollen in the honey has changed since 1952.
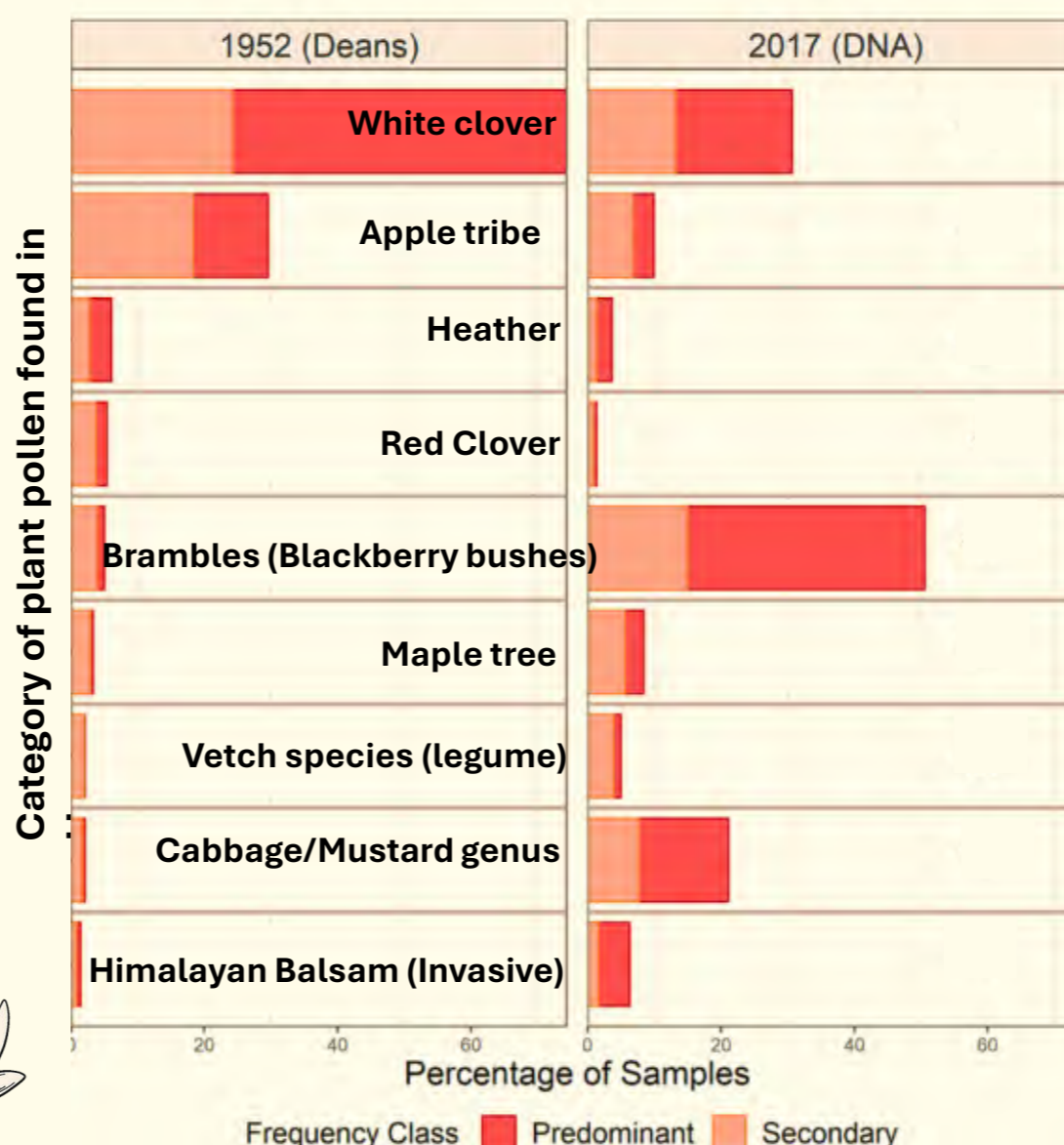
Bramble

Predominant shows the percentage of honey samples in which each pollen was a major proportion of DNA sequenced.

Secondary shows the percentage of honey samples in which each pollen was a more minor proportion.

White Clover

Read about Dr Laura Jones' work here

Research Outcomes - Happy Bees

Laura's research has helped to provide a better understanding of honeybee foraging in the UK. Through **data analysis** she discovered the most important plants per season for the bees to gather nectar. The information collected will now help beekeepers, gardeners and land-managers to create habitats that will benefit the honeybees and aid pollination.