# Australian HoneyDNA: A Citizen-Science Project

BACKGROUND

Every year the Climate Crisis seems to worsen: record hot temperatures, faster melting glaciers, stronger hurricanes and tornadoes, wildfires spreading farther and causing more damage, etc. During these unpredictable days, as natural disasters wreak more havoc on entire ecosystems, including human settlements, we turn to innovative remedies to possibly mitigate their devastating impact.

After Hurricane Maria hit Puerto Rico in 2017, a methodological study using environmental DNA (eDNA) was conducted to see if island honey, and the pollens contained within, would indicate which plants were resistant or resilient to, had recovered from, or were absent after Maria, in comparison to analyses of honey samples taken before the hurricane.
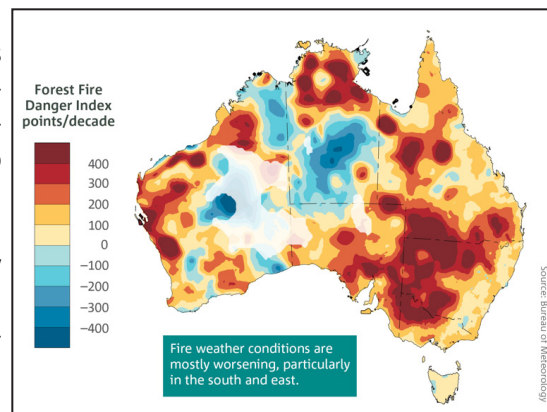
Working with this model, The Best Bees Company, Urban Beekeeping Laboratory & Bee Sanctuary, and The Ambeessadors are partnering to study other disaster-prone regions, in particular Australia, to better understand how to prepare for, and potentially mitigate, the impact of Climate Crisis-caused disasters, namely intensifying droughts and wildfires.

MISSION/OBJECTIVES

Via a multi-year, international citizen-science project, this Australian sub-study aims:

- To catalog via honeyDNA (see below) native, naturalized, and invasive flora in Australia in order to know the effects of Climate Change, specifically wildfires, on the diversity of pollinator plant species, their relative abundance, and pollinator habitat phenology (seasonal timing of blooms) in any given locale;
- To map those species to better understand which are resistant (appear continuously), resilient (return after a period of time), and/or lost to drought and wildfires, and how entire pollinator plant habitats have changed pre- and post-wildfires;
- To work with local scientists, researchers, and government agencies to develop future best management practices to stabilize ecosystems; and
- To engage citizens—not just beekeepers—in this science-based initiative, thus increasing their awareness of and appreciation for the importance of honey bees and the interconnectedness of Nature.

METHODS

1. Participants submit honey samples (minimum 20ml), whose origins can be identified geographically and temporally (before and/or after the 2019–2020 wildfires).
2. Laboratories use a scientific procedure called honeyDNA to sequence the genomic contents of each sample, thus revealing the diversity and abundance of taxa visited by honey bees within a 5km-radius foraging area.
3. Data analysts, geographers, and designers create maps of said taxa, teasing out which flora are resistant to, resilient to, or absent after wildfires.

Some limitations to this study include:

- HoneyDNA only reflects the flora visited by honey bees, thus isn't representative of non-melliferous plants in a region nor plant species visited by other, non-honey-producing pollinators.
- It may be necessary to launch a pilot program within a specific region in the first year to test the system, expand the Australia-based network, secure funding, and ramp up communications to solicit participants.


Australian HoneyDNA: A Citizen-Science Project

TARGETED AUDIENCES

This project aims to engage two primary audiences, plus a secondary group once the study concludes:

HONEY DNA
SAMPLE S005751

20.66%
170 species appearing in concentrations of less than 1%

- Beekeepers, who will submit honey samples, ideally before and after the 2019–2020 wildfires
- Honey lovers, willing to send in Australian samples
- Ecologists, botanists, conservationists, and government officials, with whom we will discuss future strategies based on the study's findings and recommendations
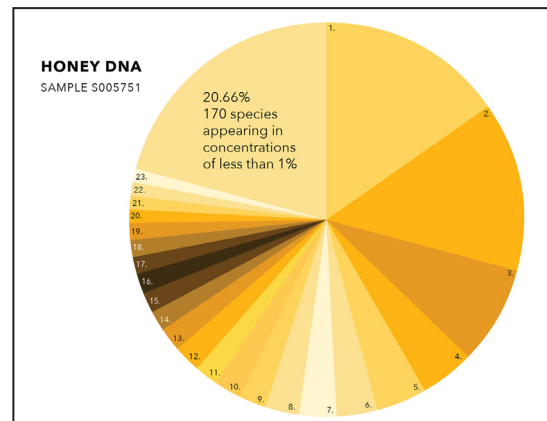
ENVISIONED OUTCOMES

Participants will receive a detailed profile reflecting the composition of each sample submitted, akin to the image above, with each numbered slice accompanied by a plant identification and its percentage of the total sample. This authentication enables beekeepers to label the predominant floral source(s) of their honeys, which in some cases might warrant charging a premium price.

HoneyDNA will also help build a more comprehensive database of Australian flora visited by honey bees. Such a system can be used to both authenticate whether a honey derives from Australian origins as well as detect counterfeit and/or adulterated honeys, thus reinforcing the country's reputation for high-quality food products.

We intend to work with specialists and governments to ameliorate potential damage from disasters by designing and implementing preventative measures, such as cultivating resistant species in advance of catastrophic events and/or immediately replanting resilient or lost species afterwards. Such a prophylactic investment in pollinator habitat will not only provide them with the best forage possible but will further stabilize Australia's beekeeping industry by ensuring continued self-sufficiency and sustainability.

REFERENCES

HoneyDNA, as featured in National Geographic (Feb 2018) and TEDxProvincetown (2018)
The Best Bees Company
Urban Beekeeping Laboratory & Bee Sanctuary
The Ambeessadors

FOR MORE INFORMATION

Contact Steve Rogenstein at The Ambeessadors: ambeessadors@gmail.com.

BEST BEES
EST. 2010
BEEKEEPING SERVICES

URBAN BEEKEEPING LABORATORY
EST. 2014
& bee sanctuary

THE AMBEESSADORS