HAWAII AND THE VARROA MITE: A CASE STUDY

Published March, 2017 | Kate Prendergast

An archipelago of volcanoes in the middle of the Pacific Ocean and the ~~supposed~~ birthplace of our old two-term president, the state of Hawaii is the most isolated population center in the world. For a heavenly stretch of years, it had miles and miles of virtually uninterrupted ocean to buffer it against the spread of pests and diseases swarming the planet elsewhere. Then came globalized man. Whether by accident (as with the coffee borer beetle) or the wayward good intent of conservationists (as with the mongoose), our bungling ways have since played havoc with the island's natural biodiversity.

As much can be said for the varroa mite – the feature pest of our weekly blog series this past fortnight, and the rampant terror laying low domestic and feral honey bee colonies worldwide.

It was 2007 that the first mite was discovered in Hawaii, creeping its crab-like way across Oahu's Makiki Valley hives, almost 30 years after its arrival on the US mainland. Soon after, it spread to the Big Island. Fortunately, on the other 135 or so other islands making up the chain, there has as yet been no trace.

While the news of the infestation was distressing for all, government officials and scientists knew an opportunity

when they saw one. A contained region, with few other fluctuating variables, they were able to use the island as a control test site on which they could measure, analyze and share reliable data on the impact of the disease in real time.

IN 2015-16, HAWAII'S 51 BEEKEEPERS SUFFERED THE SMALLEST HONEY BEE DEATHS AGAINST THE ENTIRE UNITED STATES MAP.

Led by Stephen Martin of Britain's University of Sheffield, the 2012 research effort gave evidence to some of the industry's worst fears. Where pesticides were once believed the main culprits behind colony collapse disorder, varroa was thereafter listed as enemy number one on beekeepers' watch-list (well, if you don't count humans – who really are the worst with their habitat-destroying ways).

When it first hit, the impact of the *V. destructor* mite was devastating. Hawaiian bees are of a pure line, loftily praised for their docile character – separating them from the more aggressive Africanized (or 'killer bee') strains common in America's tropical zones. Yet being meek and mild made them at the same time suckers for the haemolymph-draining, disease-carrying mite. In 2010, over half of Hawaii's colonies perished, and at least 20 beekeepers lost their entire stock. Many considered throwing the towel in for good, facing a triple threat with not only varroa to contend with, but hive beetles and nosema too. Meanwhile, ripple effects were felt by the macadamia, avocado and coffee industries – whose crops depend heavily on honey bees' pollination services for quality yields.

Most alarming were the stats showing deformed wing virus (DWV) in varroa-infested colonies. Injected into developing bee larvae during feeding, DMV is one of the nastiest pathogens that varroa plays vector to. Individuals affected by DWV emerge from brood chambers with only translucent stubs for wings – and sometimes, no wings at all. Incapable of flight, these bees totter about the comb before meeting a swift death – either on their own terms, or at the hands of their kin.

Shortly after introduction of varroa to Hawaii, the frequency of the virus exploded to a whopping 10-100%. Reports Science Daily, "this change was accompanied by a million-fold increase in the number of virus particles infecting each honey bee and a massive reduction in viral strain diversity leading to the emergence of a single virulent DWV strain."

So far, so horror story from David Lynch's ideas pad. Turn now though to the 2015-16 Bee Informed survey, and the cold sweat ends. With a miniscule 2.4% winter loss, Hawaii's 51 beekeepers suffered the smallest honey bee deaths against the entire United States map, and the lowest of its own since records began in 2009. Unlike their native yellow-faced counterparts, these domesticated bees are not going to be on the endangered list any time soon.

How did this miraculous rallying happen? The explanations vary. What's more, pinning all one's hopes conclusively to a single year's good

results comes highly not recommended – especially when you're looking at something as notoriously volatile as bee colony health.

Still, the state deserves some kudos. During the dark years of 2007-10, the state responded swiftly, launching a new apiary program that focuses on public education, beekeeper networking, control and containment. In January 2009, a crisis exemption was awarded from the Environmental Protection Agency, permitting use of the common pesticide fipronil. For 15 days in Hilo Harbor – 'ground zero' for the mite – Hawaii sprayed the pesticide over a five-mile radius. This resulted in the total extermination of bees in the area – and the mites with them.

It was a drastic measure. Since then, the island is doing what it can not to jump on the 'pesticide treadmill', which has seen so many others around the world sweat themselves into a fugue of exhaustion and anguish.

Instead, scientists have applied themselves to developing an integrated pest management (IPM) scheme that gives preference to organically approved treatments and non-chemical treatments – removing brood comb and selective breeding being the most effective. Though more time-consuming, this approach is believed to be the smarter one in the long-term. Not only does it circumvent drug resistance in the bees, but it avoids a build-up of toxic residue that risks honey quality and bee health.

Most exciting to researchers is the selective breeding program. With their first nursery a laboratory in Baton Rouge, Louisiana, strains of bee are being developed which are both resistant to varroa and well-acclimatized to the island's conditions.

"There are bees that have been selected that can detect the varroa mite inside the capped cell, so they uncap it and interrupt its reproduction," says the Hawaii Department of Agriculture's apiary specialist Dr Danielle Downey. "In these bees, the mite doesn't get a chance to produce many offspring and so the levels stay low, so the bees can help themselves and co-exist with the mites."

So far, they've managed to create honey bee lines with infection rates no higher than 5%.

Once varroa was found on Oahu and the Big Island, it was there to stay. As with any hive in any region, there's just no getting rid of the mite outside of committing bee genocide. The best any beekeeper can do is broker a détente: keeping mite levels at a stable low while doing as little harm as possible to the honey-producers themselves. Or, as Hawaiian apiarist Jen Rasmussen puts it – an island success story after recovering her original 40 hives and who now owns 85 colonies – "My strategy changed from battling the pests to empowering the bees."

ABOUT US

Blythewood Bee Company is a Bee Keeping Supplies and Honey Bee Removal service located in North Carolina and Georgia. We cater to both sides of the bee world – hobbyists and professionals, online and in-store. Call or visit us today for a free estimate.

Phone: 803-754-7577

Address: 227 McLean Rd, Blythewood, South Carolina

Email: contact@blythewoodbeecompany.com