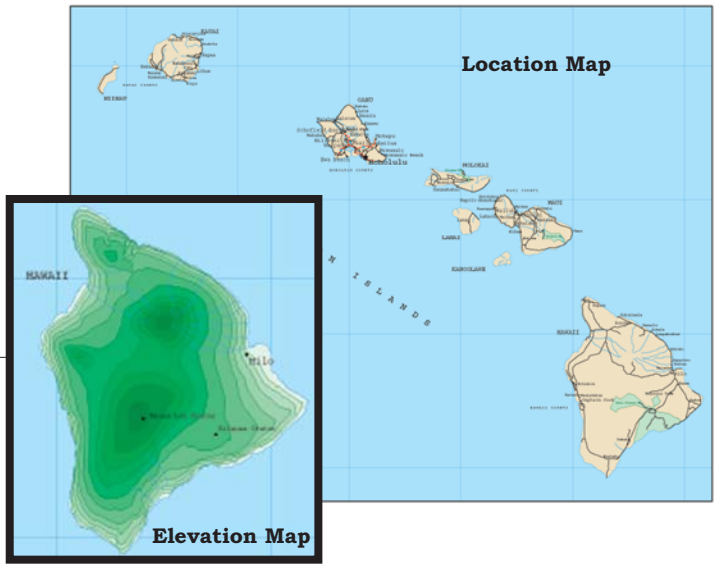
The Big Island In Crisis

Larry **Connor**

Part Two Of The Small Hive Beetle Story In Hawaii



In the April issue we looked at the widespread loss of colonies on Hawai'i, the big Island in the state of Hawaii in what some beekeepers call a "Perfect Storm" of Nosema, *Varroa* and small hive beetles. We reviewed some of the stories the beekeepers on the Island tell about their heavy losses and the challenges they have, especially with the *Varroa* mites and the small hive beetles. In this article we will review more of the biology of the small hive beetle and the impact of the mites and beetles on some of the commercial beekeepers on the Island.

Role of rainfall, warm temperatures on the explosion of small hive beetles

From my very limited visit, there seem to be two distinct groups of beekeepers as based on their prior knowledge and current experiences with the varroa mite and small hive beetle infestation on the Island of Hawai'i. The eastern side of the Island where Hilo is located has been hit the hardest. This is the wet side, receiving enormous amounts of rainfall (200-300 inches in/year some places) and consistently warm temperatures. The west side of the Island is dry, much dryer, and the area has had a period of drought that has stressed many nectar producing plants, reduced the bees' food supply, and thus weakened some colonies. Everywhere on the Island the temperature falls as you move up the mountains, and in those locations there have been fewer problems with bee losses, but that is not a guarantee.

Dr. Lilia de Guzman, Baton Rouge.

Dr. Lilia de Guzman of the USDA Honey Bee Laboratory in Baton Rouge, LA was on the Island at the same time I was in February, and reported at a meeting for beekeepers on some of her work in Louisiana as well as some preliminary work with the beetles on Hawai'i. The Baton Rouge lab redirected $50,000 of its funding to work on this project. She is working with Dr. Ethel M. Villalobos of the University of Hawaii Honey Bee Project. Villalobos and her associates focus on varroa treatments, mite-bee interactions (mite reproductive potential), as well as colony health assessment and hygienic behavior. They also work with the Hawaii's growers and pollination needs. While on the Island de Guzman and Villalobos were conducting some studies, such as feeding preferences for the beetle – seeing which tropical fruit the beetles were attracted to, and if so, which ones they might be able to feed on. Many fear the beetles can reproduce without bees.

At the meeting Lilia de Guzman reviewed the biology of the small hive beetles and how they are ideal for the hot and humid environment of the Hilo side of Hawai'i. She reported how colonies can be taken over when the heat index is over 105, especially in queen rearing colonies. The levels of the beetles are "really overwhelming" she said in the presentation to beekeepers. The beetles are extremely destructive and reproduce very rapidly. They are opportunistic – taking over a small or queenless hive very quickly. The adult beetles are sexually mature when they emerge from the pupal form (in the ground) and mate quickly.

They can be distinguished from the wax moths by their smaller head capsules and the double row of spines that run along the length of the larval body. They pop

Dr. Ethel M. Villalobos, University of Hawaii.

when squeezed, a trait many beekeepers use for rapid identification. The adults are identified by their clubbed antennae, the short elytra and the shape of their thorax, often compared to Batman's cape. The females have a long ovipositor and the male genitalia are at a 90° angle.

Their life cycle is directly influenced by temperature, with development in 39 days in Louisiana room temperature but full development in 22 days in an incubator set at 90°F. Hawai'i temperatures favor a rapid development of the beetles. In the hive the beetles eat just about everything in the bee box except the wood: brood, pollen, honey and protein patties. Feeding bees protein is also dangerous because it gives the beetles a place to lay eggs, so de Guzman recommends using just enough that the colonies can consume all the material in just two days – thus preventing rapid 'runaway' development of the beetles.

As part of the feeding process the beetles generate slime from a yeast they carry that helps ferment the honey in the hive. It gets thin and runny, and is unattractive and repellant to bees. In severely infested colonies the slime will pour out of the entrance of the hive. The process of generating the slime makes the colonies unacceptable to other bees.

Strong fliers, the beetles can find a suitable colony from a distance of eight to 10 miles. They are more active at hive entrances at dusk. They mate inside the hive and female beetles lay eggs right away. Beetles in the lab live two weeks to six months, but some have lived, with food, for over one year.

As far as bee stocks, Russian and Italian line bees have been compared for the way they handle small hive beetles. The Russian colonies had fewer beetles in their hives. They carry the beetles out of the hive when monitored in observation hives. They are more aggressive and keep the beetles out of the hive.

Ten Best Management Practices to Reduce Beetle Numbers

Lilia ended her talk with 10 ways to reduce beetle numbers:

1. Promptly remove colonies that have died because of beetle infestation. Put them in the freezer or burn.
2. Remove areas where the beetles can hide, propolis and burr comb areas, areas between frames.
3. Keep colonies strong.
4. Keep queen-right colonies. Queenless colonies attract beetles. Drone layers are weakened hives and are very attractive to beetles.
5. Don't stack supers, but if you do make sure there is no brood in them.
6. Place colonies in the sun (also works against tracheal and varroa mites)
7. Only give colonies the size pollen (protein) patty they can consume in two days.
8. Keep feeders and bottom boards clean
9. Keep your honey house clean; store pollen in the freezer
10. Extract all honey within two to three days after removing it from the hives.

Visiting other Hawai'i beekeepers

My host, Ron Hansen, drove me to several commercial honey producers and two large queen producers during my visit. Two of the honey producers were losing hives while one had not had much of a loss. Neither of the large queen producers had experienced much of a loss, in part because they were actively doing battle against the hive beetles as well as the varroa mites, using a combination of good beekeeping practices and selected control methods.

Local Buzz Hawaiian Honey

Scott Buske is a beekeeper and coffee grower in Ka'u, operating as Paradise Meadows Orchards & Bee Farm, with bees in the Pahala area of the Island. The family's Ka'u coffee earned a bronze award in 2010 at a Hawaii Coffee Association tasting, beating out the Kona growers. The coffee is grown at 1800 feet on the side of the volcano overlooking the Pacific. There are bees in the area for coffee, fruit and nut tree pollination. Buske and family market seasonal honey, and have a strong roadside and Internet sales of both coffee and honey. Both the coffee and the bees are kept in a reduced chemical environment. That seems to be changing for the bees.


Scott Buske

Colonies have been living more or less chemical free and many colonies died in the past year. Now a series of beetle traps are in place, and their management concentration is to keep colonies strong to prevent the beetles from establishing a presence in the hives. Various traps are employed for beetle capture. Colony numbers are down about two-thirds over the pre-mite+beetle invasion. The honey room is filled with empty and partially slimed equipment as a result of the invasion. Surviving colonies are under continuous attack. This sinister activity is in stark contracts with the post-card beauty of the area, and the friendliness of the five family members (Megan Collins, Scott Buske, Chris Buske, Lili Rodriguez and Erin Buchanan) who manage bees, coffee, greenhouse and a variety of other farming activities.


Coffee Cherries at Scott Buske's farm.

Queens being shipped from Kona Queen in February.

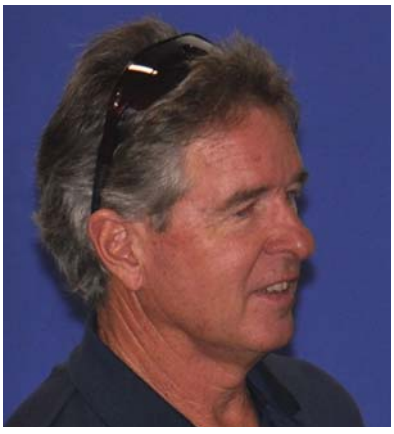
Kona Queen Hawaii

Since 1975, Kona Queen Hawaii has produced queens for sale to the World's beekeepers. They are able to ship most of the year, and service beekeepers who need queens for late season and early season splits and requeening. This has become extremely important with the large demand for queens for colonies placed in Almond pollination. In Canada, the Kona queens have been a huge part of the production of early season splits for honey production and pollination. Since 1979 Gus Rouse has been the manager of the operation. Many beekeepers have worked at Kona and developed both beekeeping and queen rearing skills. Rouse is a businessman as well as a beekeeper. Rouse is no stranger to most large beekeepers in North America, having shipped queens off the Island for decades. To learn more go to **www.konaqueen.com**.

When Ron and I visited, Gus had gone to a coffee grower's meeting where we would end up at the end of the morning. The office manager Nancy took us around and showed us the high points of the operation. Some might argue that the queen production is too machine like, but the Kona operation is impressive and the bees are treated well. They produce an enormous number of queens every year (no packages) and meet the needs of a tremendous number of beekeepers.

In spite of the problems found on other parts of the Island Kona is still shipping queens. They were a bit behind in February because of the drought the previous season, and this held the bees back a bit in build up. The shipping room was filled with queens and bees in special cages ready to be delivered to some of the major beekeepers in the United States (it was too early for Canadian shipments). Later that morning Ron and I met up with Gus at the coffee grower and beekeeper meeting with the Hawaiian Agriculture Board. When the meeting was over we had a chance to talk. Asked how he is surviving the mite and beetle attack, he simply said that many of his customers and friends have been through this on the mainland in the past, and he knows how to deal with Nosema, varroa and small hive beetles.

That does not indicate that is easy to stay ahead of these pests. But of all the beekeepers Ron and I visited, the commercial queen producers were the beekeepers best prepared to manage healthy hives and use chemicals to insure production. Of course I regret that I did not have more time to spend at Kona Queen; that is the cost of such a condensed visit.



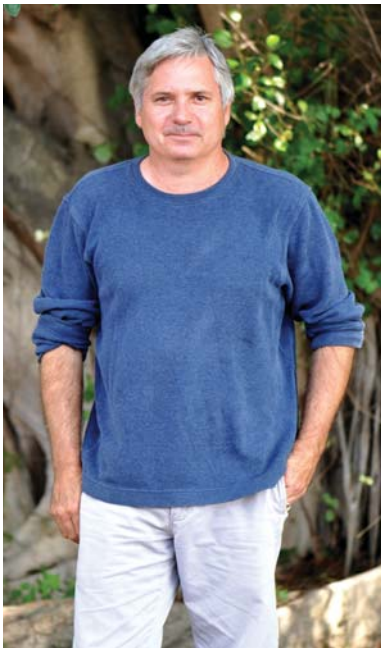
Gus Rouse

Big Island Bees

Just up the road from Kona Queen is the Big Island Bees. Garnett Puett owns the business run by his stepfather Jim Powers, one of the largest beekeepers in the world during the 1970s and 80s. In fact, Garnett showed me a large banyan tree that Dr. Eva Crane of IBRA planted in 1980; Powers and Crane were very good friends.

Puett is a fourth-generation beekeeper; his grandfather was a Dadant Branch Manager in southern Georgia for many years before he moved to establish a honey production operation. The emphasis over the past has been in the production of certified organic honey, and this is where he has run into trouble with the small hive beetles. Ron Hansen and I were able to briefly visit with Puett after the Hawaii Agricultural Committee finished a meeting and tour of coffee and beekeeping operations.

With about 3800 colonies, Puett has lost over 50% of the hives to the beetles, as evident by a huge pile of damaged combs and boxes sitting outside his warehouse. Inside the warehouse are many thousands of boxes of combs that are being kept at 45 percent relative humidity to prevent the beetle eggs from hatching and the beetles from feeding on the combs. The warehouse is not air conditioned, but the investment in two huge dehumidifiers at the cost of $500 per month for electricity has preserved the combs. Prior to that the crew cleaned up the beetle



Garnett Puett

larvae and slime on the floor of the building, filling five gallon buckets.

In the Powers tradition, Big Island Bees is a migratory operation, moving colonies by flatbed around the Island for nectar gathering. This provided a diversity of nectar sources sold on his website (**http://www.bigislandbees.com**)

Garnett, trained at the Pratt Institute, is well known in the art world for his apiscultures, a 'collaboration' between the artist and the bees to create unique beeswax sculptures exhibited around the world, including New York's Guggenhiem Museum. His work is in a number of sculpture collections and is being copied by other artists. Perhaps the current collapse of so many colonies will encourage him to take up his artwork again.

What is more likely, of course, is his abandonment of the "expensive organic status" and to follow his neighbor's leadership and use chemicals and IPM methods for control of the beetles and mites. Perhaps too he will be able to work with the queen producers and utilize some of the *Varroa* sensitive hygienic stock (VSH) that has been brought into the commercial queen producers breeder stock. It will take time to change over the drone populations on the islands to resistant drones, but the small hive beetle has certainly reduced the feral bee population to help facilitate that goal.

Big Island Queens (Olivarez Honey Bee, Inc)

In the same general area of Captain Cook, HI, is the Hawaii division of the Olivarez Honey Bee, Inc operation. The owners purchased the Big Island Queens a few years ago, and the Hawaii facility is managed by Russell Olivarez and helped by his father Ray. The combined California and Hawaiian operation is managed by Ray Olivarez, Jr., located in northern California (Chico/Orland).

Ron and I set aside a little more time to visit with Ray and Russell. We learned that they were working hard to keep ahead of the mites and beetles. As Russ said "If we loose a hive we make it up again, that same day." That approach fully utilizes the developing beekeeping operation to grow bees; that colonies during the Spring of the season are able to generate excess bees (that would otherwise swarm). It also keeps all colonies large and healthy. I was surprised that the firm uses mini-nucs, but the insulated, Styrofoam type. "We could not use them if they were not insulated", Ray said. "The temperatures on the ground (the whole Island is lava rock) can get pretty hot." All the

Russ Olivarez, Larry Connor, Ray Olivarez.

Working Cell finishers at Olivarez's operation.

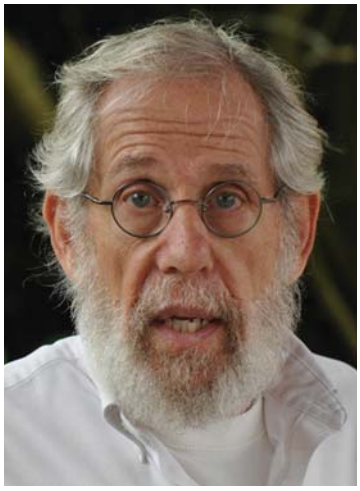
colonies are on benches or hive stands to keep the hives off the ground, in part to eliminate any overheating, but also to get away from feeding by the cane toad that will sit at the entrance of the hive and pick the bees off one at a time.

The Olivarez operation spends a tremendous amount of time paying attention to bee feeding. A special mixing tank heats sugar syrup that is inverted to decrease spoilage. Dry protein feed in a 55-gallon drum tells Ray when the bees are short on protein, and serves as a protein-feeding device. Tens of thousands of pollen foragers were working the dry feed the day we were visiting.

For the long term, the Olivarez family and other queen breeders (including Kona) are flying Tom Glenn from California with semen from the *Varroa* Sensitive Hygienic stock (developed by Harbo, Harris and many others at the Baton Rouge Bee Lab) for instrumental insemination to local queens. These queens become the breeder queens that generate the production queens that are open mated. This honors the State's ban on whole bee importation but allows the addition of varroa mite resistance to the gene pool of Island bees and provides beekeepers who buy these queens with some level of varroa resistance. That had not been possible in the past, and was one of the criticisms of queens from Hawaii (as well as Australia and New Zealand) – that there was no mite resistance in the queens that were shipped. With that change, and 88% VSH in the queen side, it will allow the beekeepers on the Island to convert over to *Varroa* resistant stocks, flood the bee trees with swarms headed by these queens and saturate the Island with drones that will provide some degree of mite protection in the future. (http://www.ohbees.com)

Volcano Island Honey Company

The Volcano Island Honey Company is the passion and result of the hard work and inspiration of Richard Spiegel. A lawyer by training, Spiegel has lived and worked in the country with only wood fires. A chain saw accident sent him to Hawaii to heal and he has been on the Big Island since 1977. Since his wife died in 1993 he has concentrated on honey production in the Kiawe forest of the northern part of the Island and focused on production of what others call some of the best honey in the world



Richard Spiegel

(National Geographic Traveler Magazine).

Chemical control is essential at least in some form. Spiegel says there "are times when you need to cut off the leg to save a life," referring to the need to move to chemical treatments that will kill mites and permit him to produce honey that is labeled organic. His honey is some of the most expensive in the world, and he and his associates take enormous efforts to produce the best product they can. Located on the northern side of the Island of Hawai'i, Spiegel is a bit removed from the main tropical beetle reproductive area around Hilo and the commercial honey and queen producing areas around Kona. His main honey crop is from the thorny legume Kiawe (*Prosopis palida*) , a mesquite species introduced by the cattlemen as a protein source for cattle. It produces a white honey that in granulated form can be like "silk". He uses that in is marketing plan.

Talking to Richard is part motivational pitch and part legal deposition. He is passionate about his work and has attracted some gifted people to partner with him in developing a unique philosophy about the work they are doing. He has been interviewed extensively about his work, and pointed to a display of magazine and newspapers that have featured his work. He has traveled considerably as a lecturer about his work, and lectured in University forums.

Richard's admission that he would use some chemicals seemed to be a reflection of the complexity of the issue at hand, and the difficulty to achieve control over the varroa mites and small hive beetles. The area where he keeps bees, with much lower rainfall and more open landscapes, may help him in this mission. Adding the selective use of chemicals will be one way to continue in business. It is clear that he will not let any pest destroy the operation he has worked to develop over the past decades.

Hawaii's overall picture certainly looks pretty grim at first glance, as outlined in last month's article. Yet there is plenty of reason to expect the Island to recover fully from the impact of the combined 'perfect storm' of Nosema, varroa and small hive beetles, but only after a rapid and intense educational program on the best way to keep bees on the Island without doing harm by chemical contamination. Such optimism is tempered by the