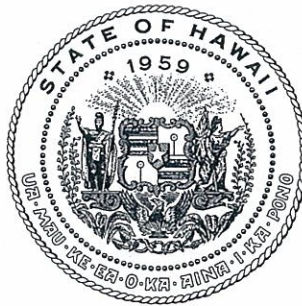


**REPORT TO THE TWENTY-SIXTH LEGISLATURE
REGULAR SESSION OF 2011**

Report on the Study, Control and Mitigation of the Bee Mite Infestation



Prepared by:

**THE STATE OF HAWAII
DEPARTMENT OF AGRICULTURE
DIVISION OF PLANT INDUSTRY
PLANT PEST CONTROL BRANCH**

In response to proviso in ACT 162, SLH 2009, section 6

December 2010

PURPOSE:

Act 162, SLH 2009, section 6, provided for a \$2,000,000 ceiling on expenditures for Plant, Pest, and Disease Control (AGR 122) to control and treat the infestation of the Varroa mite. The proviso in Section 6 of ACT 162 stated:

“SECTION 6. Provided that of the special fund appropriation for plant, pest, and disease control (AGR 122), the sum of \$2,000,000 or so much thereof as may be necessary for fiscal year 2009-2010, and the sum of \$2,000,000 for fiscal year 2010-2011, shall be expended to study, control, and mitigate bee mite infestation in the state; provided further that these funds shall be expended only in the amounts provided by the federal government and deposited into the pest inspection, quarantine, and eradication fund for this purpose; provided further that the funds shall be expended for no other purpose; provided further that the department shall prepare a report that shall include but not be limited to the status of the bee mite infestation and steps to control and treat the infestation; and provided further that the department submit the report to the legislature no later than twenty days prior to the convening of the 2010 and 2011 regular sessions.”

No federal money earmarked for varroa mite control has been placed in the pest inspection, quarantine, and eradication fund as this fund is administered by the Plant Quarantine Branch (PQ) which does not conduct varroa mite control work or control or eradication of any invasive or pest species. Response, control, and eradication of pests is conducted by the Plant Pest Control Branch (PPC). PPC received \$370,078 last fiscal year for varroa mite control and the balance was carried forward into this fiscal year. This was placed in a special fund entitled “Varroa Mite Control in Hawaii”. This report is provided to meet the conditions of the Section 6 proviso for the submission of a report on the status of varroa mite in Hawaii and steps to control the infestation.

BACKGROUND:

Origin of Varroa Mite

Varroa mites (*Varroa destructor*) originated in Southeast Asia where they are parasites on the Asian honeybee, *Apis cerana*. The mites and the Asian honeybee coexist well, with the mite rarely causing death of honeybee colonies.

In 1963, the mite jumped to hives of the European honeybee, *Apis mellifera*, which were being kept in managed bee hives by beekeepers in the area. The mite then rapidly spread to the Philippines, Japan, Vietnam, and Russia through movement of bees by the beekeeping industry. As *Apis mellifera* had not evolved with this mite, it had not developed resistance as had *Apis cerana*. The result was massive die-offs of bee colonies throughout the world. The mite has continued to spread and can now be found in Asia, Europe, North and South America, Africa, New Zealand, and most recently Hawaii. Australia is currently the only area free of varroa mite.

Current Status of Honey Bees in Hawaii

The varroa mite is currently established on the islands of Oahu and Hawaii (See the 2009 Legislative report for additional information and actions taken by HDOA) and other islands are apparently free of varroa mite infestations. Feral bee populations, based on anecdotal information and the number of swarm removals HDOA has been addressing

2010 EFFORTS

Containment of Varroa Mites

Containment and management of varroa mite on infested islands is ongoing. This is achieved through the monitoring of swarm traps placed around high risk areas such as air and sea ports and conducting removals of bees in these areas. Reductions-in-force have reduced HDOA's capacity to check swarm traps on a routine basis thereby putting other islands at risk. We have been partnering with beekeepers to fill in some of this diminished capacity.

Detect and Respond to Infestations on Mite-free Islands

Swarm traps are also in place at high risk areas on Kauai and Maui.. On Kauai swarm traps are being monitored by HDOA staff with the support of local beekeepers. The beekeepers also assist with the removal of swarms and collection of bees for analysis. With the Reductions-in-force eliminating all positions within Plant Pest Control Branch in Maui County, monitoring of swarm traps has become problematic. Monitoring has been conducted at reduced capacity through the assistance of USDA-APHIS, other members of the Hawaii Department of Agriculture, and beekeepers. All bees found in swarm traps and feral colonies collected in high risk areas were destroyed for analysis. No indications of varroa mite or other pests and diseases of honey bees have been detected on Kauai or Maui.

Apiary Program

An Apiary Specialist position was created through the Research Corporation of the University of Hawaii, funded by federal grant money. The recently hired specialist began work on December 1, 2010. The apiary specialist will be the on-the-ground expert for honey bee health issues with a focus on the varroa mite. Work will primarily be extension oriented and will focus on mitigation of varroa impacts on infested islands and preparing uninfested islands for varroa mite through enhanced education and awareness. Position descriptions have also been submitted and are ready for posting for an Apiary Technician and an Apiary Coordinator. The Apiary Technician will assist the specialist with field work and laboratory analysis of specimens in addition to conducting outreach to beekeepers. The Apiary Coordinator will be an interface between the Specialist, HDOA staff, the growers and policy makers and assist in developing advisory groups, strategies, and maintaining and enhancing communication between the stakeholders affected by varroa mite.



Dr. Jeff Pettis (USDA/ARS honeybee lab director), Dr. Robyn Rose (USDA National Program Director) and Mr. vanEnglesdorp (President of Apirary Inspectors of America) came to Hawaii in November and December. They conducted workshops for beekeepers on Kauai, Maui, Molokai, and the Big Island. They also worked with HDOA in collecting more samples for the National Honeybee Survey.

Education and Awareness Programs

Celebrity Chef Alan Wong hosted a Farmer's Series dinner on honey. As a part of the dinner, Chef Wong invited Dr. Lorna Tsutsumi, a Professor at the University of Hawaii at Hilo and HDOA to participate both in the event and in an "Adopt a Hive" program which has been implemented in other parts of the country to highlight the importance of honeybees and their current plight. This public-private partnership is designed to:

- Build awareness of the importance of honey bees for agriculture and Hawaii's sustainable future;
- Create a new generation of skilled beekeepers through educational programs;
- Provide pollination services to farmers.

Thus far, the program has been centered at the University of Hawaii at Hilo where Dr. Tsutsumi teaches a beekeeping course and is creating a sustainability garden; one acre of land with one beehive. This garden features bee friendly plants and crops and will one day include educational elements on the history of bees and beekeeping in Hawaii and the impacts of honeybees on agriculture, the environment and sustainability in Hawaii. To further these efforts, HDOA provided beekeeping equipment and supplies for the program. In collaboration with local beekeepers, bee hives were obtained for the program, however, due to the severity of SHB infestations in the area, all but one hive has been destroyed by the infestation. HDOA is working on providing additional hives for the program.

HDOA is also building an educational program with Maui Community College (MCC). MCC will be offering an introductory beekeeping course in Spring 2011. HDOA is providing the equipment and supplies to support the course.

Grower Collaborations

The impact of bees is not limited to bee produced products such as honey, wax or queens. Bees provide essential pollination services. Thirty percent of world food consumption is directly impacted by the pollination services of honeybees. An even larger percentage of world food supplies are indirectly affected by pollination by bees. In Hawaii, passive pollination of crops has been the norm, i.e. growers relied on pollination by feral bees or by allowing beekeepers access to crop lands desirable for honey production but not paying for the services provided by the beekeeper. Varroa mite has significantly reduced feral bees on Oahu and Hawaii island. The key honeybee pollination driven industries in Hawaii include but are not limited to, melons, cucurbit crops, macadamia, avocado, and tropical fruits such as lychee, rambutan and longan. A pilot program was launched by HDOA and USDA in collaboration with Larry Jefts'

The National Honey Bee Disease and Pest Survey: 2009-2010 Pilot Study Summary Report

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Executive summary

This pilot study was conducted to 1) validate and trouble shoot the sample collection process we proposed to use for a national survey effort, 2) assess the infrastructures related to shipping, storing and analyzing the specimens, and 3) gather baseline data for a broader survey of honey bee pests and pathogens that was initiated in 2010. The participating states were California, Florida, and Hawaii and a total of 87 samples were collected.

We found that our collection protocol worked well, and found that shipping live bees is a good and viable alternative to collecting and shipping bees on dry ice; however, the rate of surviving bees decreases dramatically with transit times longer than 5 days.

In all, samples from 13 different organisms with known associations with managed honey bees were examined. We found three viruses, Deformed Wing Virus (DWV), Acute Bee Paralysis Virus (ABPV) and Kashmir Bee Virus (KBV) in all surveyed states. Chronic Bee Paralysis Virus (CBPV) and Israeli Acute Paralysis Virus (IAPV) were found in both California and Florida, but not in Hawaii. Slow Paralysis Virus (SPV) was not found in any samples. While *N. ceranae* was ubiquitous in all samples, *N. apis* was notably absent, none being detected in any samples. Tracheal mites and Tropilaelaps mites were also not found in any samples. Varroa mites were found in all states, and were found particularly abundantly in some Hawaii samples.

This survey was not designed to be comprehensive representation of the country, and the results should not be interpreted to mean the absence of certain pathogens in the US or in any one particular state.

Introduction

A pilot survey of honey bee pests and diseases was funded in 2009 by the USDA Animal Plant Health Inspection Service (APHIS) and was concluded in 2010. This survey was conducted in an attempt to document which bee diseases and parasites of honey bees are currently present in the U.S., and to examine all samples for Tropilaelaps, a parasitic mite not thought to be in the U.S. This pilot survey was initiated to validate and trouble shoot the sample collection process,

Tropilaelaps. This report was also furnished to each state-level apiary specialist. A separate report that presented the results from the molecular analysis of the sampled bees was distributed to the participating beekeepers and state-level apiary specialists. This report provided the participant with a positive or negative result for the six bee viruses targeted, the two Nosema species targeted, and the presence or absence of Trypanosome in the sampled apiary.

Part of the survey included a visual inspection of the hives before sampling; therefore, the presence of the following symptoms, pests and brood diseases was also recorded, but not analyzed, at the apiaries for each sample taken:

1. American Foul Brood
2. Black Shiny Bees
3. Chalkbrood
4. Deformed Wing Virus
5. European Foul Brood
6. Parasitic Mite Syndrome
7. Sac Brood
8. Small Hive Beetle Adults/Larvae
9. Wax Moth Adults/Larvae

Evaluation of sampling protocol

Live bees were shipped via the U.S. Postal service from each apiary to Beltsville, MD for molecular testing. In each live bee 'kit' was a petri dish that contained both a small amount of water and some hard "queen" candy for food for the bees. This kit contained approximately 12000 live adult bees at sampling time. The percentage of bees lost in transit was directly affected by the length of time samples were in transit (Figure 1). There was a noticeable decline in the percentage of live bees surviving in sampling boxes when they took 5 days or longer to arrive. It is not known whether this was due to temperatures experienced during shipping or a lack of food or water or a combination of all three variables.



Figure 3: Geographical Distribution of Florida Pilot Samples

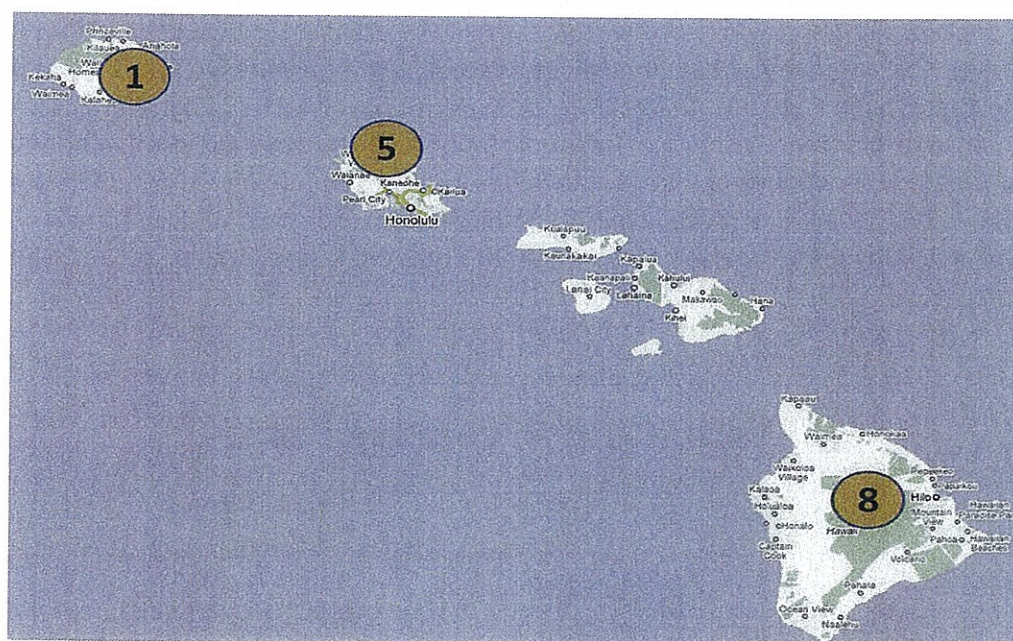


Figure 4: Geographical Distribution of Hawaii Pilot Samples

Results

The results of molecular analysis are given in Figure 5. This graph shows the prevalence of pathogen detection in aggregate apiary level samples taken from all states. Neither Slow Paralysis Virus (SPV) nor *Nosema apis* were found in any samples.

*Figure 6: Prevalence of Varroa and N. ceranae in sampled apiaries.
(Standard Error bars are reported)*

Conclusions

The sample protocol developed worked well and the shipping and storage methods were sufficiently robust to justify the initiation of a national effort. The sample size and sampling effort were not robust enough to make any categorical statements about the absence of parasites in the US. So, while no *Tropilaelaps* mites were found in these efforts, neither were honey bee tracheal mites nor *Nosema apis*, both of which are known to be present.