



Department
of Agriculture
STATE OF HAWAII

Plant Pest Control Branch

Program Overview

Neil Reimer, Manager

Darcy Oishi, Biological Control Section Chief

Becky Azama, Chemical and Mechanical Control
Section Chief

1428 South King St. Honolulu, HI 96814

Phone: (808) 973-9525 Fax: (808) 973-9533 Email: hdoa.ppc.@hawaii.gov

Plant Pest Control Branch (PPC)

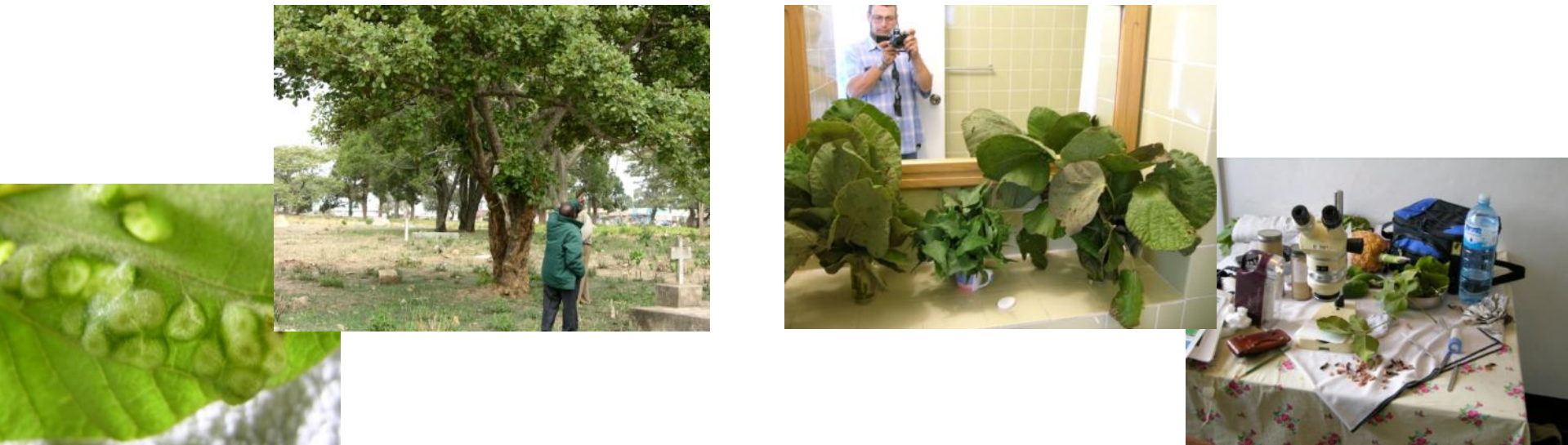
- **Survey and Detection**
- **Diagnostics**
- **Risk Assessment and Rapid Response**
- **Biocontrol (=long-term control)**
- **Seed Inspection**
- **Research**
- **Resources**

Biological Control: Target Selection

- Feasibility of control using natural enemies
- Knowledge of host range of pest and locality of Hawaiian source material
- Current Targets
 - Weeds: Fireweed, fountain grass, skunk vine
 - Insects: Small hive beetle, coffee berry borer, banana aphid

Foreign Exploration

- Begins with extensive research on and in home range of the pest
- Continues in the field with close observations
- Collection of insects or diseases that exhibit favorable characteristics



Host Range Testing

- Evaluate against plants or insects that are
 - Closely related to the pest
 - Economic or ecological significance
- Two types of tests
 - Choice Test
 - No Choice test
- Testing ranges from 2 years to 10+ years



Choice and No Choice Tests

- Choice test: Natural enemy is given
 - Known host plant
 - Test plant
- No choice:
 - Natural enemy must survive on test plant or die
- Future of natural enemy is decided on these tests

Release: Permitting

- Federal Permits
 - USDA Permits with Fish and Wildlife Section 8 Consultation
 - Publishing of an EA
- State Permit
 - Two review by Board of Agriculture
 - Publication of EA

Monitoring

- Studies are done before and after a release is made
- Assists in making future decisions
 - If natural enemy is established
 - If pest is under control
 - If non-target effects are being seen
 - If additional releases are necessary



Invasive Ant Program

- *Detect and if possible eradicate new invasive ant infestations*
- *Develop control methodologies for*
 - Eradication
 - Industry use
 - Homeowner use
- *Develop Pacific Wide Program*



Monitoring of new chemical treatment option



Testing a new control method

Apiary Program

- *Create an Apiary Program with temporary funding with long term goal of creating a permanent program*
- *Develop a biosecurity program*
- *Develop better beekeepers and more informed populace*

Honeybee queen certification
for export to Canada

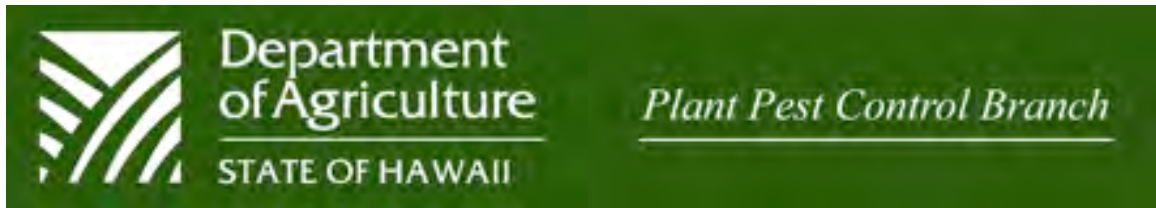


Inspecting for honeybee pests



Chair Kokubun conducting the National
Honeybee Pest Survey





Program and Functions at a Glance

Mission: The primary mission of the Hawai'i Department of Agriculture's Plant Pest Control Branch is to provide a favorable environment for agricultural development in Hawai'i by limiting plant pest populations that have the potential to cause significant economic damage by using chemical, mechanical, biological, and integrated control measures to eradicate or control plant pests.

Legislative Authority

- HRS 141
 - HAR4-67: Seed Rules
 - HAR 4-68A: Noxious Weed Rules
 - HAR 4-69A: Pests for Control or Eradication

Functions

- Pest Detection
 - Detect pests through surveillance programs using visual inspection, lures, bait trapping at high risk areas, routine field operations, in support of other agencies and individuals
- Diagnostics
 - Identify arthropods and plant pathogens affecting agricultural crops and environmental resources
 - Only plant pathology facility capable of identifying high risk pathogens in the Pacific Basin
- Response and Rapid Control
 - Control new infestations of pests through the use of mechanical and chemical control programs including pests such as coqui frog, coffee berry borer, and varroa mite
- Long-term Control Programs (Biocontrol)
 - Identify, Evaluate and Release host specific natural enemies to control invasive pest species
 - Recent successes include Erythrina Gall Wasp, stinging nettle caterpillar,

Program Needs

- Positions
 - Statewide Pest Detection Entomologist
 - Plant Pathologist to enhance ability to do biocontrol research and conduct foreign explorations
 - Insectary Entomologist
 - Additional Noxious Weed specialist staffing for Kaua'i, Maui County and O'ahu.

Funding

- Dedicated annual funding for foreign exploration and biological control operating budget (\$50k necessary, \$100k desirable)
- CIP funds for upgrading the Plant Pathology and Arthropod Containment Facilities

Activities of Plant Pest Control Branch



History: Plant Pest Control Branch traces its history back to the reign of King David Kalākaua who created in 1890 the “Laws of the Hawaiian Kingdom” to prevent “immigrant” insect pests” from entering Hawai‘i and to control those already established.” Albert Koeble, a pioneer in biological control, was the first entomologist for the Hawaiian Kingdom and was appointed head of the Division of Entomology under the Territorial Government. In 1959 statehood saw the creation of the Department of Agriculture and Conservation, Bureau of Plant Pest Control.

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Pest Detection: Detection of new pest species or the expansion of the range of pests known to be in Hawai‘i is critical to invasive species management. PPC conducts detection programs at:

- High risk areas such as ports of entries and nurseries.
- Routine field operations,
- Responding to pest calls,
- Information or leads provided by other agencies,
- Or to facilitate export as a result of the presence of a federally regulated pest.

By utilizing visual surveillance programs, bait trapping, and pheromone trapping.

Recent detections include:

- Varroa mite,
- Naio thrips,
- Protea mealybug,
- Small hive beetle,
- New low level infestations of gorse, and
- New infestations of fountain grass and cogon grass



Ant surveillance program

Diagnostics: Once pest detections are made, rapid, accurate, identification of a pest is necessary to determine the appropriate course of actions. Plant Pest

Control Branch has the facilities and expertise for both arthropod and plant pathogen diagnostics. Housed within PPC is



Coffee Berry Borer

- The largest reference collection of pest arthropods in Hawai'i;
- Extensive library of literature for pest insects, pathogens, and weeds;
- Database resources of pest identifications, detections and releases of biological control agents;
- The only plant pathogen facility approved for use in diagnosing potential agro-terrorism agents (also known as select agents) within the Pacific.

Risk Assessment and Rapid Response: Following identification, response plans are based on a risk assessment. This includes surveys to determine how widespread an infestation is, likely pathways and speed of movement and other factors based on the pest biology. The control program may be a full scale response with the goal of eradication of the pest, responses to assist industry to get the pest under control or under certain cases long term response through the use of biocontrol. Recent control actions include:

- Varroa mite,
- Coffee berry borer,
- Small hive beetle, and
- Basil downy mildew.



Coffee Berry Borer interagency response program.

Response work involves fostering positive working relationships with the affected shareholders and providing education and technical assistance including advice or actual application of pesticides, trapping or removal of the pest, using lures to lower the pest populations or conducting eradication projects.



Citric acid treatments for coqui frog

Detection, diagnostics and response capability has been extremely curtailed due to the loss of staffing. The department is dependent upon Federal funding which dictates the priority pests to focus. With the loss of a statewide pest detection coordinator and Maui entomologist, active pest detection programs by the department have been limited.

Seed Inspection

Farmers, homeowners, landscapers, and many others are dependent upon seeds for professional or personal use. PPC screens sample lots of seeds for Federal noxious weeds and other potential weed species of concern to the state. If weed seeds are detected on shipments coming from foreign sources, recommendations are made to USDA. For domestic seed inspections, action is taken immediately to prevent potential weed outbreaks.

Long term Control Programs-- Biological Control: There are always pests that are

- Costly and not sustainable to control using chemical or mechanical means;
- Present in difficult to access locations; and
- Are well controlled in their home range.



Nettle Caterpillar Natural Enemy Monitoring

Under these conditions, we evaluate if the pest is amenable to biological control. Hawai'i has a long history of successful biological control introductions. While many misconceptions surround biocontrol, modern practices entails careful thought and planning, both on what is targeted and what natural enemy would be safe, efficient and low risk to

Hawai'i. It is not a silver bullet but a method of

balancing the effects of a pest that is out of control. After careful field observations and stringent testing designed to ensure natural enemy will not affect other species if released, the department will pursue releasing the disease or insect into the environment. While initial outlays can be expensive, it is a self-sustaining form of control that does not involve the use of toxins that can enter and persist in the environment.



A beetle being evaluated for control of skunk vine

Successful projects include:

- Whiteflies,
- Ivy gourd,
- Erythrina gall wasp, and
- Nettle caterpillar.

These are all successful projects with no non-target effects. Currently the department is looking for solutions for problems such as banana aphid (a vector of banana bunchy top disease), skunk vine, fire weed, fountain grass, miconia, and others.



Field release of a natural enemy of Erythrina Gall Wasp

Research: PPC conducts research on treatment methods for invasive species in collaboration with growers and landowners. The research includes non-pesticide based control methodologies such as barriers to prevent coqui frog from moving into new areas, testing of pesticides to obtain licenses , quarantine exemptions, or special local needs permits for use in Hawai'i and developing new and novel ways of deploying pesticides for specific applications.

PPC Extramurally Funded Programs

Background: Due to the complexity of some issues, the need for specialized expertise for long-term projects are critical and beyond the capacity and capabilities of the Plant Pest Control Branch with the resources available. As a result, PPC looks for extra-mural funding to support these program functions.

Invasive Ant Program:

Invasive ants represent one of the most serious agricultural and environmental threats posed to Hawai'i. In some cases, like the Imported Fire Ant and the Little Fire Ant, they also pose a threat to human health and domesticated animals. Social insects like ants also pose difficulties in terms of control as they exhibit a remarkable ability to adapt to control methodologies. Recognizing the importance of invasive ants, in 2008, the HISC allocated \$50,000 to develop an Invasive Ant Program based upon the work of Ellen VanGelder who developed the Hawai'i Ant Plan. Utilizing this funding with the specific intent of obtaining more funding to create a sustainable program, Plant Pest Control hired Dr. Cas Vanderwoude. Within five months, he obtained extramural funding to support the program and quickly developed novel techniques for controlling ants and determined specifics of the Hawai'i Ant Plan were not feasible unless there was:

- Research on effective pesticides,
- Effective mechanisms for pesticide uptake,
- Registration of those pesticides,
- Development of viable mechanisms for delivery of those pesticides,
- Testing of control practices, and
- Transferring that technology into the public arena.

Through a steady stream of funding by the Prevention Working group in 2009 and 2010 and the Established Pets Working Group in 2011 (funds are still in the transfer process) utilized for leveraging funds from extramural sources such as the USDA-Forest Service, the Farm Bill, County of Hawai'i and other funding sources, the program has expanded to become the Hawai'i Ant Lab and now consist of three people working a wide range of projects including research and development of new techniques and technology for killing little fire ant; detection, control, and eradication of little fire ant; implementing an eastern Pacific offshore detection program; addressing concerns of the public; and working with affected industries to overcome problems created by little fire ant.

Major accomplishments include:



A modified fire extinguisher dubbed the "Ant-stinguisher" useful for larger scale control applications



Testing of the Ant-stinguisher. Only water was used for the test so no PPE was

•Evaluation of chemical/bait combinations attractive to and effective against little fire ant

•Development of different strategies to deploy chemical/bait combinations including:

- A modified grease gun (Master Blaster);
- A modified spackler (Spackler of Death);
- Modified fire extinguishers of various sizes (the Ant-stinguisher);
- A custom built, pressurized water balloon canon (the Brent-gator).

•In conjunction with other partners, the eradication of little fire ants from Maui

•Standardization of ant survey and reporting techniques throughout Hawai'i and the US Pacific Territories and Protectorates

Apiary Program



The Bee Team

History: There is a long history of bees and beekeeping in Hawai'i. First brought to Hawai'i to support the pollination needs of ranchers, honeybees have become an important agricultural product for Hawai'i both in terms of honey production and the production of honeybee queens for the rest of the world. Honeybees are a good example of the globalization of trade. Honeybee queens from Hawai'i provide pollination services for nuts, fruits, and vegetables which also results in products such as cooking oil, beef, milk, etc. In fact, about 80% of the food we consume is directly or indirectly affected by honeybees. Although Hawai'i has been the epicenter of the world for bees due to the presence of the largest queen rearing industry in the world, little attention was paid to this industry, despite departmental attempts, to ensure national food security until *Varroa* mite and then small hive beetle appeared in Hawai'i. Following the detection of *Varroa* mite on O'ahu,

funding was appropriated to the HDOA; however, due to an inability to hire staff, the program never fully developed. In 2009, funding from the USDA allowed for the creation of an Apiary Program to:

- Hire staff including an Apiary Specialist, Apiary Planner, and Apiary technician;
- Bring outside expertise into Hawai'i
- Conduct the National Honeybee Health and Pest Survey

- Develop survey, response, and eradication programs
- Develop educational programs for beekeepers, growers and the public

Since July, 2011, the Apiary Program has been operating at full capacity with support from both Plant Pest Control Branch and the Plant Quarantine Branch. While the USDA monies limits the activities of the Apiary Program to *Varroa* mite, HDOA personnel have been conducting research on small hive beetle, including studies on its biological life cycle in Hawai'i outside of the hive and searching for potential biological control agents. In cooperation with USDA-ARS research is ongoing to evaluate the feasibility for Sterile Insect Technique (flooding of the environment with sterile males to compete with fertile males).



Chairman Kokubun assisting with the National Honeybee Health Survey

With the help of Act 200 which created a voluntary beekeeper registration program in June 2011, the Apiary Program has identified significant issues here in Hawai'i. Hawaiian bees are not just faced with small hive beetle and *Varroa* as problems but a disease known as *Nosema* which is the bee equivalent of the flu—itself not fatal but in combination with *Varroa* and small hive beetle, can be deadly. Beekeepers are now faced with more active management issues and higher labor and production costs. Growers are faced with a lack of knowledge of the importance of bees for their crops. The Apiary Program has been successful at addressing these issues.

Major Accomplishments of the Apiary Program:

- First comprehensive honeybee health survey of the state in almost 20 years
- Development of education and awareness programs for beekeepers, growers, and the public
- Improved knowledge of best management practices
- Free nosema testing
- Collaborative work with USDA-ARS, USDA-APHIS and other programs.



Honeybee queen cells. Hawai'i is the largest supplier of queens to North America impacting even cooking oil and dairy production.

Biocontrol in Hawai‘i

*Working with Nature
to Find a Sustainable Solution*

What is Biocontrol?

Biocontrol uses a natural predator as a tool to manage widespread pests that damage our agriculture & environment



Forest & Kim Starr

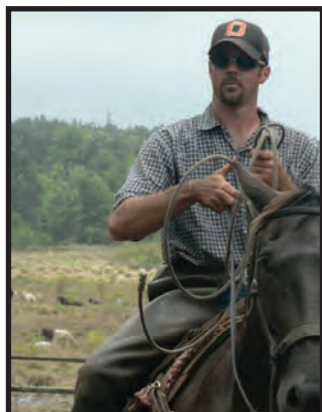
Why do we need biocontrol?

In 2002, the Hawai‘i State Legislature identified invasive species as “the single greatest threat” to our economy, natural environment, and the health of our communities. Many of the most destructive invasive species in Hawai‘i have spread beyond manual or chemical control. Biocontrol is a cost-effective, sustainable method that has been successfully used in Hawai‘i and across the globe for long-term management of the world’s worst pests. We need biocontrol to help protect our natural and cultural resources from the continuing unchecked damage caused by invasive species.

A Hawai‘i pasture invaded with fireweed. *This yellow pest is toxic to livestock. In Australia, fireweed costs the cattle industry and government \$2 million every year. The Hawai‘i State biocontrol program is awaiting approval on a natural predator that is a cost-effective option to slow the spread of this noxious weed.*

How does biocontrol work in Hawai‘i?

The Hawai‘i Department of Agriculture’s Plant Pest Control Branch houses the expertise and equipment needed to conduct an effective biocontrol program. This local capacity has been built up over many decades, making enormous strides in biocontrol methods and technology. The program goes through a rigorous, step-by-step process and follows stringent regulations, permitting, and assessments to ensure that the selected natural predator will benefit Hawai‘i’s environment without harm.



Biocontrol Protects Our Food and Forests

“Hawai‘i’s rangelands and forests have greatly benefitted from the use of biological controls through the years. Beginning with controls for lantana as far back as 1902 and subsequently helping to reduce the infestation of panini, pamakani, klamath weed, emex, and gorse, Hawai‘i’s ranchers have highly valued the work that has been done. The cattle industry continues to appreciate this service to help battle the more recent spread of species such as fireweed and strawberry guava.”

— Chris English, Ponoholo Ranch, Ltd President, Hawai‘i Cattlemen’s Association

Meet the good bugs!



The Eurytoma wasp comes to the rescue for this galled wiliwili tree.



These little critters help to keep the stinging nettle caterpillar in check.



Invasive panini cactus being eaten by the Cactoblastus caterpillar.



This moth helps to prevent ivy gourd from taking over our forests.



Forest & Kim Starr

Wiliwili seeds have been traditionally used to make beautiful lei. The first surfboards were made with wiliwili wood.

A Story of Success...Saving the Wiliwili

In 2005, Hawai'i was struck by one of the most devastating examples of an invasive species. The Erythrina gall wasp hitchhiked into Hawai'i on cargo and within months was killing wiliwili trees across the state. Highways and farms lost their windbreaks. Businesses lost their ornamental landscape. And Hawai'i's own unique native wiliwili was threatened with extinction. The pesticide options were expensive and not very effective. Many dead trees were removed, while an emergency seed collection began in attempt to save the species. All eyes turned to the state biocontrol program for a solution. The Department of Agriculture sent an entomologist to Africa in search of the gall wasp's natural predator. Many insects were found, but the most promising was a tiny parasitic wasp, which was brought back into an approved containment facility. After years of meticulous testing to ensure that the natural predator would do the job and be safe to other plants and animals, it was released in November 2008 and is already showing signs of controlling the Erythrina gall wasp. Our native wiliwili is making a comeback!

Biocontrol Restores Balance to our Environment

Before and After

Photos taken of a panini cactus infestation on Parker Ranch in Waimea. The photo on the right shows how successful biocontrol reclaimed the ranchland for agricultural use in just 10 years. The cactus is still present, but in smaller numbers.



Natural predators help us to manage widespread pests in Hawai'i like these.



OISC



MISC



Fountain grass is a pasture invader and fuel for wildfires. Foreign explorations have begun to look for natural predators in its native range.

Miconia is known as the green cancer of the Pacific. It impacts our watersheds and native species. HDOA and the USDA Forest Service are collaborating to find natural predators that could help to slow the spread of this pest that already covers thousands of acres.

The **nettle caterpillar** packs a serious sting. It also feeds on ornamental and agriculture plants. Without biocontrol, it could have a major impact on our local horticultural industry and quality of life. A natural predator has been found to help keep it in check.

Banana bunchy top virus makes our banana plants sick and spreads by an insect. A natural predator is being tested in quarantine.

For more information about biocontrol in Hawai'i

<http://hawaii.gov/hdoa/pi/ppc>

808.973.9530

hdoa.info@hawaii.gov



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