REPORT TO THE TWENTY-FIFTH LEGISLATURE
REGULAR SESSION OF 2010

REPORT ON THE FIGHT AGAINST INVASIVE SPECIES

FOR THE PERIOD OF
JULY 1, 2007 - JUNE 30, 2008
&
JULY 1, 2008 - JUNE 30, 2009

Prepared by

THE STATE OF HAWAII
DEPARTMENT OF AGRICULTURE
PLANT INDUSTRY DIVISION

In response to Act 213, Section 9, Session Laws of Hawaii 2007

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SECTION I

Background

A. Act 213

Act 213, Section 9, Session Laws of Hawaii 2007, requires that the Hawaii Department of Agriculture (HDOA)

"…shall prepare a report that shall include but not be limited to how well Hawaii is doing in the fight against invasive species, including data, measures of effectiveness, cost breakdowns, and outcomes from its efforts to:

(1) Inspect and detect greater numbers and percentages of invasive species at airports and harbors;
(2) Jointly work with other agencies and the community; and
(3) Control and eradicate alien species established in Hawaii;"

B. Scope of the Report

This report covers the period of July 1, 2007 - June 30, 2009, and is primarily focused on the activities of HDOA's Plant Pest Control branch which is responsible for controlling and eradicating alien species that have become established in Hawaii. HDOA's effort at airports and harbors is described in a separate report on the Biosecurity Program, authorized by Act 236, Session Laws of Hawaii 2008. Both reports describe HDOA's work with other agencies and the community to address invasive species.

C. Role of the Plant Industry Division in the Hawaii Department of Agriculture

The programs of the Hawaii Department of Agriculture's Plant Industry Division are designed to protect Hawaii's agricultural industries, natural resources, and the public from the entry and establishment of detrimental plants, animals, insects, weeds, and other pests; and to assure the safe and efficient use of pesticides in Hawaii.

This division plays an important role in monitoring cargo and passengers at all ports of entry for the illegal importation of potentially harmful pests. They also help local farmers export horticultural materials through their plant nursery inspection program; help control and eradicate insects and diseases through biological, chemical or mechanical means; and provide seed analyses and certification services for nursery plants. The division certifies pesticide applicators, licenses pesticide products for sale and distribution in Hawaii, and monitors use of all pesticides and sales of restricted-use pesticides.

D. Role of the Plant Pest Control Branch in the Plant Industry Division

The primary mission of the Hawaii Department of Agriculture's Plant Pest Control Branch is to provide a favorable environment for agricultural development in Hawaii by limiting plant pest populations that have the potential to cause significant economic damage. This is achieved through statewide programs using chemical, mechanical, biological, and integrated control measures to eradicate or control plant pests, including insects and mites, mollusks, weeds, and

plant pathogens. New pest advisories keep the public abreast of new threats to our environment. Other responsibilities of the branch include certification of seed and inspection and certification of honey bee queens for export.

The Plant Pest Control Branch is composed of two sections:

The Biological Control Section engages primarily in work commonly referred to as “classical” biological control, the importation and colonization of natural enemies (predators, parasites, and pathogens) to control pests.

The Chemical/Mechanical Control Section uses chemical (pesticides) and/or mechanical (rouging, trapping, digging, etc.) methods to control plant pests such as insects, snails, noxious weeds, and plant diseases. Whenever possible, chemical and mechanical methods are integrated, resulting in an optimum level of control with fewer chemicals. The Chemical/Mechanical Control Section is also called upon to act on plant pests in the early stages of infestation when there is a chance for eradication.

E. On-Going Activities of the Plant Pest Control Branch

- Prevent distribution of noxious weed seeds by examining seed shipments originating from foreign and domestic seed sources for exotic seeds, such as fireweed, field bindweed, and quack grass.

- Conduct statewide surveys to delineate infestations of regulated pests for control or eradication. Determine statewide distribution of noxious weeds (e.g., fireweed and fountain grass), plant diseases (e.g., banana bunchy top virus and papaya ringspot virus), insect pests (e.g., little fire ant) and coqui frogs. Utilize GIS technology to map survey results for use in planning and communication with decision makers.

- Increase survey, detection and diagnostic activities to detect, identify, delineate, and eradicate incipient infestations of invasive alien species, such as the red imported fire ant, Africanized honey bee, coconut rhinoceros beetle, and many other serious pests not yet found in Hawaii. Seek extension of present federal funding support and new funding to increase personnel, equipment, and supplies necessary to implement this action.

- Seek federal and private sector funding to supplement operating funds to conduct foreign explorations to search for and introduce potential biocontrol agents of targeted weeds and plant pests, such as fountain grass, fire weed and little fire ant.

- Make maximum use of personnel temporarily assigned to the Branch from Federal and other State agencies to assist with survey and biocontrol projects, respectively.

- Develop an Insect Diagnostic Identification Network for Hawaii and the American Pacific with land grant universities and departments of agriculture in Hawaii, Guam, American Samoa, Commonwealth of the Northern Mariana Islands (CNMI), and Federal States of Micronesia (FSM) with funding from Research, Education and Extension Service (UH-CREES). USDA via the University of Hawaii, Cooperative Extension.

F. Acknowledgements

The fight against invasive species is too important and too large an undertaking for any one department of government, non-profit agency, or industry or community group to undertake on its own. While this report focuses primarily on the activities of the Hawaii Department of Agriculture, we greatly appreciate the direct and indirect support provided to the department by:

United States Department of Agriculture (USDA)
Agriculture Research Service (USDA-ARS)
United States Department of Agriculture Animal Plant Health Inspection Services (USDA-APHIS)
United States Department of Agriculture Forest Service (USDA-FS)
United States Department of Agriculture Natural Resources Conservation Service
Department of Land and Natural Resources Division of Forestry and Wildlife (DLNR DOFAW)
University of Hawaii College of Tropical Agriculture and Human Resources (UH-CTAHR)
University of Hawaii County Extension Services (UH-CES)
University of Hawaii at Hilo
Hawaii Invasive Species Council (HISC)
Pacific Cooperative Studies Unit (PCSU)
Oahu Invasive Species Council (OISC)
Big Island Invasive Species Council (BIISC)
Maui Invasive Species Council (MISC)
Molokai Invasive Species Council (MoMISC).

In Section II, we have identified various program achievements during the reporting period and where appropriate, identified stakeholders who were contributory.

SECTION II

Program Highlights

A. New Pest Detections

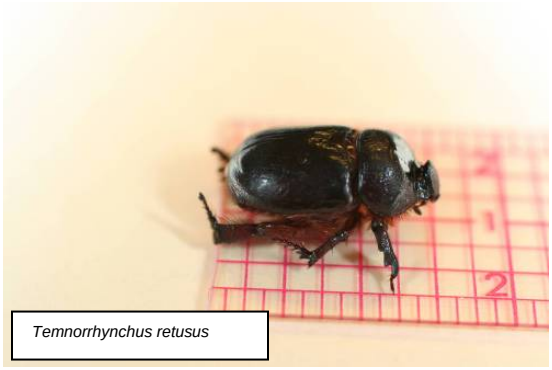
The following pests were detected by Plant Pest Control branch during the reporting period. These pests were not previously known to exist in Hawaii.

Aleuroctonus vittatus attacking spiraling whitefly

- Spiraling whitefly parasitoid *Aleuroctonus vittatus* (Dozier) (Hymenoptera: Eulophidae)
    - Detected October 2007, Sand Island, Honolulu.
    - Detected August 2008 in Waiakea Uka, Hawaii on banana leaves.
    - Detected September 2008 at Maui Community College.
    - This species seems to be an effective natural control of spiraling whitefly.
    - Action taken: As this is a beneficial insect species that will help control spiraling whitefly populations, no further action was taken.

- Thrips on bamboo orchids; *Dichromothrips smithi* (Zimmermann) (Thysanoptera: Thripidae)
    - Detected in October and November 2007 in Puna.
    - Feeds on various orchid species in India, Malaysia, Thailand and Taiwan.
    - Actions taken by PPC: Researchers at USDA-ARS are looking into the impacts of this thrips species. As such, PPC has deferred to USDA ARS.

- Masked chafer beetle, *Cyclocephala pasadenae* (Casey) (Coleoptera: Scarabaeidae)
    - Detected in May 2007 in Waikoloa, Hawaii.
    - Feeds on the roots of turf grass.
    - Damage can be extensive.
    - Species probably in Hawaii for about 10 years based on investigative results.
    - Action taken: Based on the significant time the masked chafer beetle was in Waikoloa and the numbers collected, the masked chafer beetle has been determined to be well established on Hawaii Island. The masked chafer beetle does not appear to be a significant pest nor have the impacts seen on the U.S. mainland. If the situation changes, PPC will work with the University of Hawaii to address any issue.



Temnorrhynchus retusus

- Scarab Beetle, *Temnorrhynchus retusus* (Fabricius) (Coleoptera: Scarabaeidae).
  - Detected August 2007 in Kohala, Hawaii by University of Hawaii researchers.
  - Known pest of turf grass.
  - Unknown how long present in Hawaii.
  - Action taken: Investigations made by University of Hawaii researchers determined that damage done by *T. retusus* was not significant. UH is taking the lead on this issue.

Banded Cucumber Beetle

- Banded cucumber beetle, *Diabrotica balteata* LeConte (Coleoptera: Chrysomelidae)
  - Detected October 2008, Kanaha Beach Park, Maui on Aeae (*Bacopa monnieri).*
  - Banded cucumber beetle has a wide host range and the potential to be a significant agricultural pest.
  - Action taken by PPC: Known populations are being monitored. Historically, Diabrotica species have been unable to establish themselves in Hawaii as they require a cold period (diapause) during their life cycle. The population location in wetland habitat precludes the use of chemical control programs. Monitoring will continue to determine if other potential hosts are attacked.

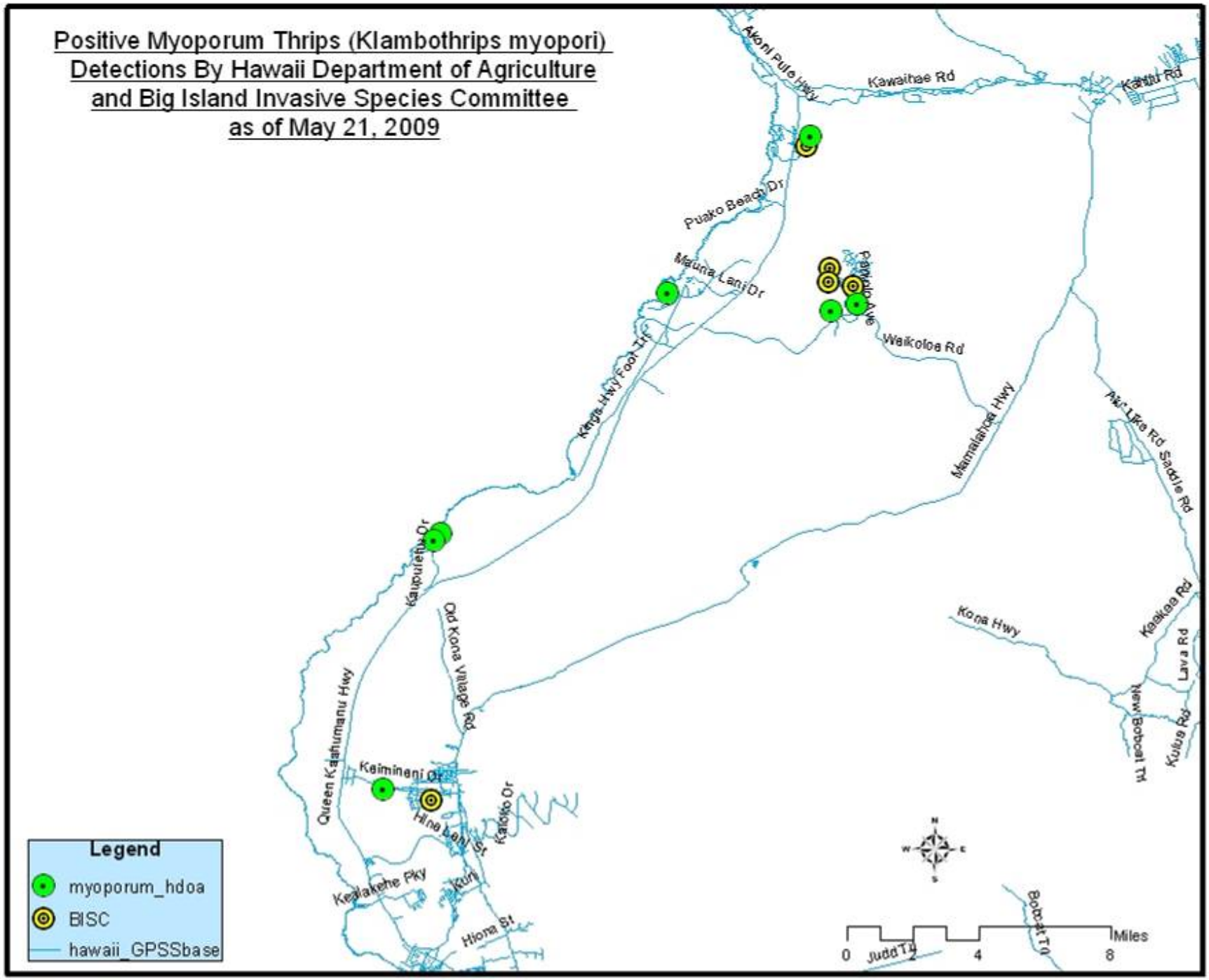
Rambutan infested with white mango scale

- White mango scale, *Aulacaspis tubercularis*
    - Infested shipment of rambutan was intercepted by California Department of Agriculture (CDFA) and HDOA was subsequently notified in February 2009.
    - Rambutan infested with white mango scale and a closely related scale was found in Waiakea, Hawaii.
    - Action taken by PPC: Based on existing knowledge of scale infestations on rambutan in Hawaii, it has become apparent that one or more scale species which are closely related may be attacking rambutan further clouding the issue. Specimens have been sent to various experts in scale insects including experts with the CDFA and United States Department of Agriculture Systematic Entomology Laboratories. Until the species identifications are resolved, Plant Pest Control will continue to monitor the infestations.

Myoporum thrips on Naio

- Myoporum thrips, *Klambothrips myopori* (Thysanoptera: Phlaeothripidae)
    - Detected March 2009, Waikoloa, Hawaii on *Myoporum sandwicense*, the naio is native to Hawaii and is a significant dry land forest plant. It is one of two tree species

that forms the habitat for endangered Hawaiian honeycreepers. Significant pests to naio could jeopardize the forest birds and other organisms.
    - It is increasingly used as a landscaping plant, especially in its ground cover form also known as naio papa. It is used heavily in resort communities on the west side of Hawaii Island.
- Significant pest of *Myoporum laetum* (Ngaio) in California.
- Has potential to kill plants.
- Anticipated to spread rapidly throughout state.
- Based upon available treatments and the extent of infestation, it has been determined the Myoporum thrips is established with no possibility of eradication. Chemical treatments may slow the spread of this species. Biocontrol options are being explored.
- Action taken by PPC:
    - Surveys:
        - Hawaii Island surveys were conducted by PPC, UH-CTAHR, DLNR-DOFAW, BIISC with input from private industries including Crop Protection Services (CPS).
        - Statewide surveys were conducted by PPC staff.
        - Information was sent to landscaping industries, arborists, botanical gardens, and nursery industries.
        - Infestation has been determined to be limited to South Kohala, North Kona and Waimea only.
        - Surveys on all islands by PPC staff are ongoing.
    - Control Efforts:
        - Chemical treatments were launched by PPC with formulation advice from UH-CTAHR and Crop Protection Services. Treatments demonstrated no immediate control. Research is ongoing and being led by UH-CTAHR.
        - Cultural practices have been identified as a key mechanism for spread of the thrips; landscaping industry has been advised on best practices to help prevent spread and control the problem.
        - Natural spread of the thrips has also been documented at some sights in Kona and in Waimea.
        - Natural enemies and predators may have some impact on the myoporum thrips populations although studies in California have not shown positive effects of known thrips predators in exerting any form of control. PPC will evaluate the effects of natural enemies in regulating Myoporum thrips populations.
        - Biocontrol is currently being evaluated. Difficulties are anticipated in finding suitable biocontrol agents.
            - Unknown native range that is still being debated by experts.
            - Biocontrol of thrips outside of greenhouse settings has met with limited success in the past.
            - HDOA containment facilities may not be permitted to do host-range testing by USDA-APHIS Permitting. Thrips projects regulated by APHIS entails a higher level of containment than currently exists for Insectary operations. A biosafety level 3 facility (BSL-3) with filtration of exhaust air and processing and treatment of all wastes is typically required for biocontrol projects involving thrips none of which is currently available for insect biocontrol programs.


Positive Myoporum Thrips (Klambothrips myopori)
Detections By Hawaii Department of Agriculture
and Big Island Invasive Species Committee
as of May 21, 2009
Akoni Pule Hwy
Kawaihae Rd
Puako Beach Dr
Mauna Lani Dr
Waikoloa Rd
Mamalahoa Hwy
Kaiminani Dr
Old Kona Village Rd
Queen Kaahumanu Hwy
Kona Hwy
Kealakehe Pky
Hina Lani St
Hiona St
Legend
myoporum_hdoa
BISC
hawaii_GPSSbase
0
2
4
8
Miles

B. Foreign Exploration

Sustainable, long-term control of pests can be achieved by the prudent use of insects or diseases (natural enemies) known to attack a pest in its native range. PPC engages in activities to find natural enemies through its foreign exploration program. Organisms are collected in often times politically, socially and economically unstable countries at considerable risk to personnel. Careful observations are made in the field to screen for potentially valuable organisms which are collected and brought back into containment facilities according to state and federal regulations, for testing and evaluation.

From	To	Countries Visited	Targeted Pests	Discoveries
1/30/2007	3/26/2007	South Africa, Tanzania, Mozambique, Madagascar	Erythrina gall wasp, Fireweed, Fountain Grass	*Eurytoma erythrinae, Aprostocetus nitens, Aprostocetus* sp. 2. Over 50 additional agents were observed in the field
9/6/2008	12/3/2008	South Africa, Tanzania, Eritrea, Swaziland, Saudi Arabia	Erythrina gall wasp, Fireweed, Fountain Grass, Ivy gourd	2 rusts on fireweed (pending identification), 1 bacterial leaf spot on fountain grass (pending identification), Chrysomelid beetles on fireweed, *Trupanea inscia*

Many of the natural enemies identified were not recoverable due to problems encountered in shipping samples from foreign countries. In the future, if funding allows foreign explorations, it will be critical to identify a means of safely transporting samples back to Hawaii in order to prevent the loss of valuable cultures and negating all of the effort by our exploratory entomologist.

Due to department budgetary restrictions, no foreign explorations have been conducted since December 2008. Budgetary restrictions have also resulted in the loss of funds allocated specifically for foreign exploration. This lack of funding directly impacts the ability to develop sustainable control programs for established pests leaving mechanical and chemical control as the only viable methods to deal with these pests.

C. Major Pest Control Efforts

Varroa Mite

Background

Varroa mites are one of the most destructive pests of honey bees. Adult female varroa mites lay their eggs in the brood cells of bee hives. The mites feed on bee larvae and pupae, resulting in deformation of the wings and bodies of bees when they develop and emerge as adults. They also feed on adult bees. The feeding causes a decline in bee populations which ultimately reduces pollination necessary for the production of tropical fruits and vegetables.

In early April 2007, a Manoa beekeeper reported what he suspected was a varroa mite infestation. It was subsequently confirmed by HDOA and surveys detected the mite around Oahu in managed and feral hives. To date, surveys have been conducted on Kauai, Oahu, Molokai, Maui, and Hawaii.

On August 22, 2008, surveillance trapping detected varroa mites in a swarm located near Hilo Bay. In January 2009, HDOA requested a crisis exemption from the Environmental Protection Agency to use a common pesticide, fipronil, to eradicate bees within a five-mile radius of Hilo Harbor. The exemption was valid for 15 days and HDOA is assessing the effectiveness of the latest eradication program.

The Plant Pest Control Branch, Plant Quarantine Branch and the Pesticides Branch of HDOA have been working with the local bee industry to develop a strategic plan for the containment, control and management of the varroa mite situation in Hawaii. The goal of the plan is to control the mite population to very low levels on Oahu and Hawaii and to prevent the mite from moving to uninfested islands.

Action Taken by PPC on Oahu

- Initial efforts were focused on containing infestation to the island of Oahu.
- Working with the University of Hawaii, PPC developed control methodologies for bee keepers.

- A detailed report entitled Report on the Study, Control, & Mitigation of the Bee Mite Infestation, which details the status of the bee mite infestation as of December 2007, was submitted to the Legislature and can be found on HDOA's website at: http://hawaii.gov/hdoa/pi/ppc/varroa-bee-mite-page.
- A giving program has been established to provide bee keepers with materials to survey for Varroa or to evaluate different methodologies for Varroa control on condition they report their findings back to HDOA. These materials include:
    - Survey
        - Stickyboards
        - Apistan
        - Information sheets on how to use the products
    - Infestation mitigation
        - Super cells (smaller brood size to accelerate bee development)
        - Drone comb (allows easy removal of drone brood which varroa prefers)
        - Apistan
        - Mite Away II

Current Status on Oahu

- Infestations are well established on Oahu.
- Populations of feral bees are dropping and in some cases impacting crop production.
- Swarm traps around ports continue to be monitored. All swarms caught are killed and examined for varroa mite infestation and for other bee pests.
- Calls of bee swarms or bees are handled internally by HDOA staff or referred to the University of Hawaii.

Action Taken by PPC on the Big Island

- Initial effort was to:
    - Eliminate all bees in the area immediately around the infestation (1 mile radius).
    - Eliminate feral bees in a 3 mile radius.
- 169 swarm traps installed (17 swarms captured).
- 187 feral hives sampled (19 varroa positive).
- 181 feral hives killed.
- 407 managed hives were sampled (45 varroa positive).
- Multi-agency effort encompassed over 10,000 man hours. Outside agency support included:
    - University of Hawaii at Manoa
    - University of Hawaii at Hilo
    - USDA-APHS
    - USDA-ARS
    - USDA-NRCS
    - Volunteers

Current Status on Hawaii Island

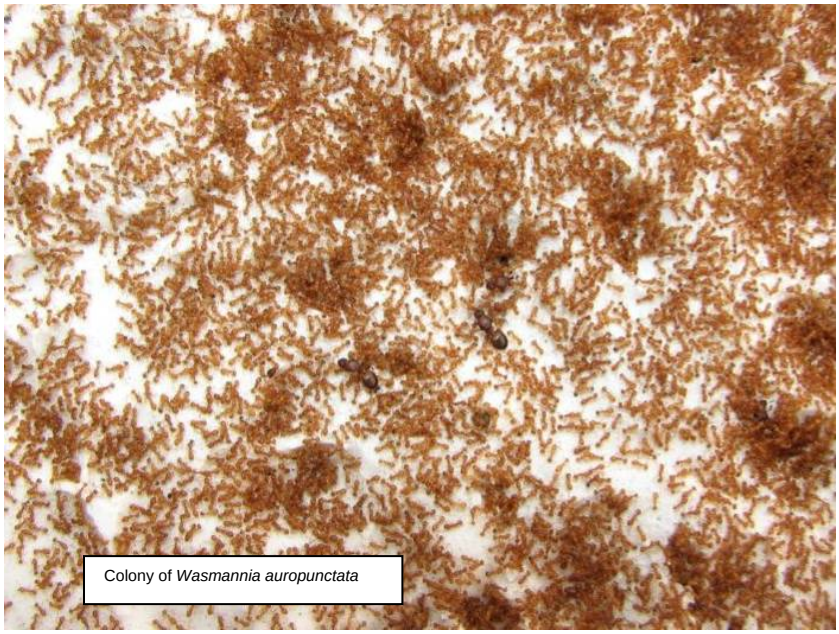
Despite a multi-agency effort, varroa mites spread through the movement of managed hives believed to be varroa free to areas beyond the combined ability of all of the agencies and organizations involved to control varroa mite using currently available technology. Treatments using bait stations laced with the toxicant fipronil were effective in reducing baseline population of bees in certain areas. However, during the course of the response it became clear that honey and other additives for baiting systems were not as attractive to bees as natural nectar and pollen flowers, especially the flows found in macadamia orchards. As a result, bait stations were not as effective as hoped. Before the 15 day response period ended during which fipronil was used, it was learned a bee keeper unknowingly moved hives infested with varroa to a location five miles away from the hot-zone. As a result of the inability to compete with natural nectar and pollen sources, and the movement of bees by a beekeeper, thereby expanding the range of infestation, the goals of the project were not met.

Future Plans

- Infested islands
    - Work with bee keepers and growers
        - Educate them on proper bee care to minimize impacts of varroa mite and to improve detection of new bee pests.
        - Develop network between bee keepers and growers to insure grower's pollination needs are met.
- Uninfested islands
    - Develop buffer areas around ports.
    - Needs effective bait and toxicant combination (UH is developing this technology).
    - Continue detection work.
    - Prevent movement of bees from infested islands to uninfested islands.
    - Improve bee keeper skills in anticipation of varroa.

- Apiary program
    - Create two to three positions using HISC and USDA funds.
        - Apiary Specialist to run program under direction of the Biological Control Section Chief.
        - Apiary Technicians to perform work under supervision of Apiary Specialist.
    - Work with bee keepers to improve surveillance network.
    - Develop and educate bee keepers on best bee keeping practices.
    - Provide certification services for the movement of bees within the state, between states and international.
    - Assist in meeting the needs of industries dependent upon bees.
    - Evaluate potential bee registration program.
    - Program will determine the value of establishing a permanent apiary program within Plant Pest Control.
- Education
    - Conduct training session statewide with assistance of UH-CTAHR on survey and detection of varroa mite and other pest issues.
    - Bring experts from mainland and abroad to educate bee keepers on how to deal with varroa and other pest species.

Invasive Ants



Colony of *Wasmannia auropunctata*

Background

Invasive ants have the potential to cause extreme ecological, economic and social impacts to the islands of Hawaii. Two in particular, the Little Fire Ant (*Wasmannia auropunctata*) and the Imported Fire Ant (*Solenopsis invicta*) are especially damaging. The Wasmannia has invaded the Big Island where it is distributed on the east coast between Laupahoehoe and Pahoa, and has also been found on a single property on Kauai. Already, the impacts of this species are being felt by homeowners and agricultural producers. The Imported Fire Ant is widespread

across the southern USA and currently Hawaii is the only US State with suitable climate that is free of this species. These ants can impact our native ecosystems, tourism, agriculture and even our outdoor oriented way of life.


Cat stung by Little Fire Ant

Action Taken by PPC

- An Invasive Ant Specialist was hired in January 2009. The position is funded through the HISC and was hired through the PCSU. The specialist is based in Hilo and is focused on:
    1. Development of comprehensive strategies for ant detection and control;
    2. Development of specific control techniques for Little Fire Ant in arboreal settings;
    3. Serving as a resource for invasive ant species issues for the state.

  Since his hire, the specialist has accomplished the following:
    - Received a competitive award to conduct research into control of Wasmannia on fruit and nut crops;
    - Received funding from Hawaii County Department of Research and Development for the hiring of interns;
    - Developed mitigation plans for green waste sites in Hawaii County;
    - Working with a resort on West Hawaii experiencing problems with pestiferous ants on the golf course;
    - Optimized and improved detection ability of existing survey protocols;
    - Worked with Kauai staff to review current practices being employed to eradicate existing Wasmannia infestation;
    - Met with various agricultural industries, Farm Bureau, and attended fairs to educate people on the threat of invasive ant species to Hawaii;
    - Worked with various growers to control Wasmannia infestations in East Hawaii.

  - Imported Fire Ant
    - Ongoing detection program at ports and nurseries: The focus on this species is prevention through early detection. All points of entry into Hawaii (airports, seaports and nurseries receiving plants from IFA infested states) are regularly surveyed to ensure this species has not become established. To date, no incursions of this species have been detected.

- Little Fire Ant (*Wasmannia auropunctata*)
    - Ongoing detection: Past experience with the epidemiology of this species indicates that human-mediated spread is largely through the movement of potted and mature plants from infested areas. The focus for this species is to:
        1. Prevent its spread to west Hawaii (especially the coffee-growing areas)
        2. Prevention of inter-island spread.

      This is achieved by a strategy of:
        - Early detection at
            - points of entry
            - high risk nurseries
        - Inspection/certification of inter-island plant exports from the currently infested area.
        - Increasing the public awareness of this species and its modes of spread.
        - Research: In collaboration with UH-CTAHR, chemical trials are being conducted to find effective insecticides for use with in-lab trials and field trials.
        - Education:
            - Training packages are being developed for the nursery industry that provides individual nursery operators the skills and knowledge to detect and treat infestations;
            - A series of fact sheets is planned.

Future Plans

- Development of an emergency response plan for invasive ant incursions.
- Development of standard operating procedures for invasive ant survey.
- Promotion of voluntary certification scheme for nurseries in Little Fire Ant infested areas.
- Promote program with Federal partners (USDA-APHIS and Customs and Border Protection) to increase:
    - Awareness of invasive ant issues
    - Promote detection and response methodologies for invasive ant species through regulated pathways
- Continuing public outreach program.
- Continuing engagement of island Invasive Species Councils in invasive ant awareness and survey.
- Continuing engagement of Hawaii County for long-term ant strategy.

Nettle caterpillar (*Darna pallivitta*)

Nettle caterpillar on Maunaloa vine

Background

The Nettle caterpillar was first found in a plant nursery in Panaewa, Hawaii in September 2001. It currently can be found in East Hawaii, Maui (Haiku), and Oahu (Kipapa, Mililani Mauka, and Waimanalo). The caterpillar has a wide host range feeding on the leaves of grasses and other monocots. The caterpillar poses a human health hazard as hairs on the caterpillar can sting causing painful itching, burning and may produce welts that can last for days, weeks or possibly months.

Nettle caterpillar sting

Action Taken by PPC and Other Stakeholders

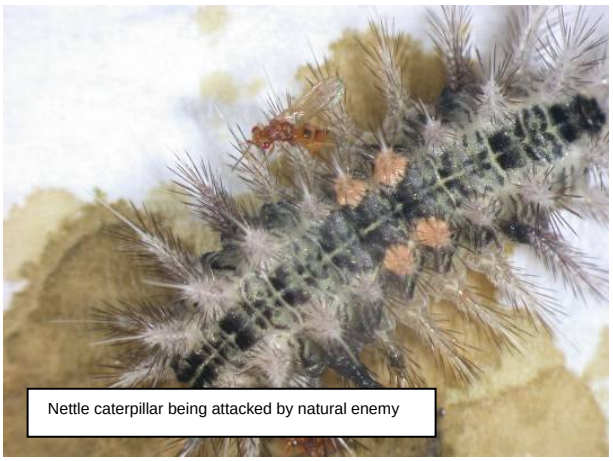
- Nettle caterpillar Pheromone: The true chemical pheromone produced by the female moth to attract the male moth for mating was isolated and identified by the United States Department of Agriculture, Pacific Basin Agricultural Research Center (PBARC), in Hilo in 2006. A scientific publication reporting the identification of the pheromone appeared in Entomologia Experimentalis et Applicata in 2007.
    - Pheromone has been deployed statewide for use in detection of adult moths;

    - HDOA has contracted for the custom synthesis of 1,000 grams of the nettle pheromone for use in mass trapping and mating disruption programs in Hawaii to be conducted jointly by the HDOA and USDA-ARS on Oahu (Kipapa Gulch, Mililani, and Makakilo).
- Area-wide Programs: Multi-agency programs were launched utilizing the Nettle moth pheromone on Maui and Oahu. Agencies involved include OISC, MISC, MoMISC, and USDA-ARS. Objectives of Area-wide Programs are:
    - Determine the size of infestations;
    - Launch control program;
    - Determine effectiveness of chemical spray program;
    - Provide community education and outreach.

Current Status

Combination of extensive manual and chemical controls was unable to eradicate populations in Haiku, Mililani Mauka and Kipapa Gulch. Infestation in Waianae was successfully eradicated. It appears that population densities can be very high with no visible signs of damage or reports of stings. Infestation has spread despite multi-agency efforts.

Future Plans



Nettle caterpillar being attacked by natural enemy

- Biocontrol: Work has been completed on a natural enemy of Nettle caterpillar. State and Federal approval to release the insect is currently being pursued.

Erythrina Gall Wasp

Background

The Erythrina Gall Wasp (EGW) was first detected in April 2004 at the University Lab School, Oahu. It quickly spread statewide attacking *Erythrina* sp. of plants including *Erythrina sandwicensis* (wiliwili), a species found only in Hawaii and *Erythrina variegate* a plant used as a wind break and as a landscaping plant.

Actions Taken by PPC

- Initial survey and response:
  - Statewide surveys were quickly launched.
  - Infestations found on all other islands within six months of first detection on Oahu.
  - Chemical treatments evaluated by HDOA, UH-CTAHR and DOFAW and found to be cost prohibitive for effective control of EGW.
- Biocontrol program:
  - Feasibility of biocontrol program evaluated and exploratory entomologist sent to identified target areas in 2004, 2007 and 2008.
  - Multiple agents identified for evaluation and HDOA focused on three wasp species:
    - *Eurytoma erythrinae:*
      - Collected in Tanzania.
      - Host-range testing initiated in March 2005.
      - Completed host-range testing in Dec. 2006.
      - Permission to release granted by USDA-APHIS and HDOA in November 2008.
      - Field releases were initiated in November 2008. Releases have been conducted on Oahu, Maui, Molokai, Lanai, Hawaii and Kauai in a variety of settings and environments.
      - Current status: Over 6,000 female natural enemies have been released. Releases have been conducted in association with USDA-FS, DLNR-DOFAW, and the UH-CTAHR in partnership with public and private landowners. Populations of the natural enemy have

become established on Oahu, Maui, Hawaii and Kauai. The natural enemy is beginning to show signs it is spreading on its own. No changes in hosts of the natural enemies have been seen.

Eurytoma erythrinae on galls

- *Aprostocetus nitens*
  - Collected in Kenya.
  - Host range testing completed May 2009.
  - Additional evaluations ongoing to determine non-target effects including potential effects on *E. erythrinae.*

Entomologist Cynthia King releasing natural enemies at the Honolulu Zoo

Future Plans

- Monitoring of field releases of *E. erythrinae* will be conducted. Information will be provided on:
  - Effectiveness in different environments.
  - Need to release second agent under development.
  - Conduct additional foreign exploration for *Aprostocetus* sp. 2.

Fireweed

Background

Fireweed is a significant rangeland pest on Maui and Hawaii. It produces compounds that are toxic to cattle and horses. It is difficult to manage and control existing populations. Furthermore, it has the long term potential to dominant rangelands eliminating Hawaii's remaining and already eroded cattle and milk industries.

Actions Taken by PPC

- Chemical/Mechanical Control
    - Large scale control in heavily infested area is not feasible on range lands
    - Localized infestations are handled by HDOA
- Biocontrol.
- Program funded in part by ranchers.
- Fireweed is related to many native Hawaiian plants requiring extensive host range testing to fully evaluate potential non-target effects.
- *Secusio extensa* (Madagascar moth)

    - Collected in Madagascar in 1999
    - Defoliates fireweed plants in the lab
    - Host range testing completed in 2007
    - Currently awaiting approval from federal and state regulatory agencies for field release.

- *Trupanea inscia* (flowerhead feeding tephritid)
    - Collected in South Africa in 2008
    - Larvae feeds on the flowerheads of fireweed
    - Host range testing is currently ongoing.

Future Plans

- Complete host range testing of Trupanea inscia.
- Evaluate potential impacts of defoliation on fireweed.
- Conduct future explorations to collect biocontrol agents previously tested/documented and find new potential biocontrol agents.

Coqui Frog

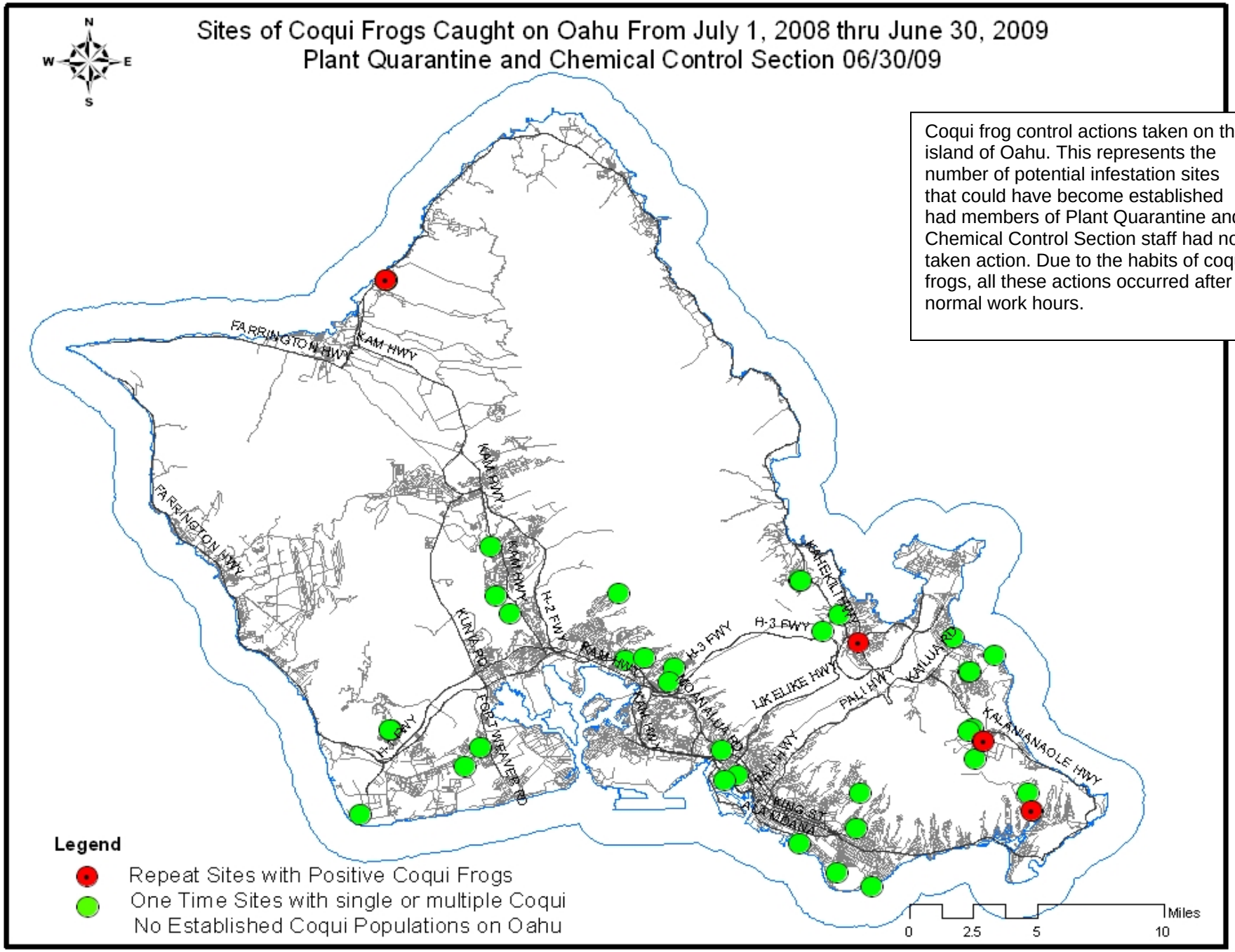
Background

The coqui is a small light-brown to dark-colored frog with variable patterns including a light stripe down the middle of its back. Adult frogs measure up to two inches in length. Coqui do not have natural enemies in Hawaii to keep populations in check. The warm tropical weather likely promotes breeding all year long. In some areas, populations may exceed 10,000 frogs per acre, which consume more than 50,000 insects per night. As such, coqui may endanger native Hawaiian insect populations, including plant pollinators, and compete with Hawaii's native birds. The noise levels have been measured at up to 80-90 decibels, comparable to that produced by a lawnmower. Coqui infested areas have caused restless nights for residents and visitors who are unable to sleep due to the noise produced by the shrieking frogs. Coqui frogs are currently well established on the island of Hawaii. Infestations are limited on Oahu, Kauai, and Maui.

Actions Taken by PPC and Other Stakeholders

- Sprayer Loan Program: Spray equipment is made available to community groups, plant nurseries and private individuals for control of coqui frogs at no charge on Hawaii, Maui, Oahu and Kauai.
- Oahu:
    - PPC has collaborated with the Oahu Invasive Species Committee (OISC) and U.S. Army to control populations of coqui frog;
    - Staff has used steamers to sanitize nursery containers and vehicles of frogs;
    - Regular surveillance is done at nurseries receiving shipments from Hawaii Island including the use of recording devices;
    - Selected nurseries have been trained on surveillance and control techniques.
- Big Island:
    - PPC has assisted in the development of additional hot water shower systems for the nursery industry in cooperation with University of Hawaii;
    - PPC staff is developing physical barriers against coqui frogs in nursery settings;
    - 72,000 pounds of citric acid purchased to assist nursery industries.
- Kauai:
    - 37,000 pounds of citric acid purchased for
        - Kauai use at the single existing infestation site;
        - Citric acid is being provided to KISC for their use.

- Maui:
    - Thirteen populations of coqui frog currently exist;
    - PPC staff consults with homeowners and nurseries to identify potential coqui frog infestations and capture and treatment methods;
    - Maui Invasive Species Council responds through clearing habitat and spray programs.


Sites of Coqui Frogs Caught on Oahu From July 1, 2008 thru June 30, 2009
Plant Quarantine and Chemical Control Section 06/30/09
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Coqui frog control actions taken on the island of Oahu. This represents the number of potential infestation sites that could have become established had members of Plant Quarantine and Chemical Control Section staff had not taken action. Due to the habits of coqui frogs, all these actions occurred after normal work hours.
FARRINGTON HWY
KAM HWY
KAM FWY
KUNIA RD
H-2 FWY
H-3 FWY
KAMEHAMEHA HWY
KAILUA RD
LIKELIKE HWY
PALI HWY
KALANIANAOLE HWY
KING ST
ALA MOANA
FORD WEAVER RD
Legend
Repeat Sites with Positive Coqui Frogs
One Time Sites with single or multiple Coqui
No Established Coqui Populations on Oahu
Miles
0
2.5
5
10

Banana Bunchy Top Virus (BBTV)

Background

Banana bunchy top virus (BBTV) is a disease affecting banana that is spread by the banana aphid. Infected banana plants will produce bananas at a reduced rate and eventually will stop producing bananas outright. Eventually the plants will die from the disease. BBTV is spread by the movement of its vector, the banana aphid, through wind, ants, or by people moving infected plants to areas that are free of the disease.
Distribution:

- Hawaii Island: Concentrated in Keaau and Panaewa, and in North-Kona and Kohala.
- Widespread on Oahu, Maui and Kauai.
- Molokai: Limited to Kualapuu.
- Lanai: Not known to occur; limited survey due to travel costs and limited funding.

Actions Taken by PPC

- On-going containment and management practices for Hawaii, Kauai and Maui.
- Limited chemical control work on commercial farms being performed by HDOA.
- Assist commercial farmers with technical advice, education, and surveys to detect diseased plants.
- Occasionally assist in treating diseased plants on Kauai and Maui in West Lahaina.
- Assist growers on the Big Island with detection and treatment as requested.
- Molokai work being conducted by Hawaii and Maui staff when infestations are found with cooperation of MoMISC and UH-CES.
    - Education and outreach conducted to public on Molokai
        - Visit residents with MoMISC and UH-CES;
        - Attend Earth Day 2008 to give information on BBTV as well as other issues

Future Plans

- Staff will travel quarterly to Lanai for survey.
- Current programs will continue.
- Retirement of Oahu based General laborer has resulted in reduced capacity to assist Oahu growers on detection and response.

SECTION III

Administration

A. Revision of Administrative Rules

Chapter 69A, Hawaii Administrative Rules, titled Pests for Control and Eradication, was revised and approved by the Board of Agriculture in December 2008. The revised rule includes new pests found in Hawaii such as the coqui frog, nettle caterpillar, and the little fire ant.

B. Facilities Planning

When the economic situation allows, HDOA will support the upgrade of biocontrol facilities and/or the potential for building new modernized facilities to increase the biocontrol program's capabilities to respond to new emerging and established pests. The first year will involve the scoping of existing facilities in other states and countries, corresponding and working with program managers in those programs and investigate funding opportunities. The direction the program takes in subsequent years will depend on findings from the first year, the overall goal, however, is to double or triple the biocontrol capacity of the HDOA in five years. Prior to the start of the current economic turmoil, we anticipated completion of a new or upgraded facility by 2012. New and/or upgraded facilities will allow the testing and evaluation of pests and biocontrol agents not currently allowed in existing containment facilities.

C. Fiscal and Personnel Management

Act 213, Section 9, SLH 2007, appropriated $196,014, or so much thereof as may be necessary for fiscal year 2007-2008, and $236,352, or so much thereof as may be necessary for fiscal year 2008-2009 for five (5) additional positions in the Hawaii Department of Agriculture, Plant Pest and Disease Control Program (AGR 122), to meet state mandates to respond to, control, and eradicate invasive species. In addition, the Act appropriated $75,000 per year for foreign explorations for the biological control of invasive pests in Hawaii.

(Note: Reductions in FY10 have eliminated the $75,000)

The funding was appropriated as follows:

	First FY	Second FY
Personnel*	$121,014	$161,352
Foreign Exploration	75,000	75,000
	$196,014	$236,352

*Plant Pathologist (#98001A), $31,608; $42,144
Entomologist IV (#98002A), $31,608; $42,144
Pest Control Tech III (#98003A) $19,998; $26,664
Pest Control Tech III (#98004A) $19,998; $26,664
Clerk typist II (#98005A) $17,802; $23,736

The positions were filled in AGR122 in the Plant Pest Control Branch to support early detection, containment and control of pests of agricultural and environmental concern to Hawaii:

	Date Filled
Plant Pathologist IV	2/26/08
Entomologist IV	3/17/08
Pest Control Technician/Aids (2)	
Taxonomy	6/12/08
Plant Pathology	3/12/09
Clerk Typist II	12/19/08

(Note: Reductions in FY10 have eliminated a Plant Pathologist IV, Entomologist IV, Pest Control Technician III, and General Labor position).

Position Descriptions:

Plant Pathologist IV:

For more than 20 years, there has been only one Plant Pathologist in the state system and the responsibilities and workload of that position have increased significantly over that period. Besides doing research on the biological control of weeds and managing the plant pathogen containment facility (the primary duties of the position), the plant disease diagnostic workload has increased to over 400 identifications annually. The majority of these disease identifications are priority identifications made for State Plant Quarantine on perishable commodities entering the state. Plant Pest Control was able to hire a new plant pathologist in March 2008. However, the senior plant pathologist for PPC retired in December 2008; filling of the position was frozen as a cost cutting measure and the position was then lost. Therein, the plant pathology program in AGR 122 relies on a single plant pathologist, as in the past, at the current time.

Entomologist IV:

This entomologist position performs taxonomic identifications for the program. The duties include the identification of arthropods submitted by the public, pest control industry, and farming community. The position also supports all of the early detection, survey, biocontrol, and chemical control programs being conducted by the branch by identifying the arthropods that are encountered in these projects. An accurate identification is critical to determine if a new invasive species is present in the State, to determine proper methods for conducting delimiting surveys and monitoring of populations, to ensure that proper control measures are applied, to ensure that the intended biocontrol agent is released into the State and not a different but similar species which may have dire consequences, and to study the effectiveness of biocontrol programs. In addition, this position also supports the biocontrol program by identifying insects and other arthropods collected outside the State and brought into the Insect Quarantine Facility to conduct research before they can be released. Typically, the entomologist identifies 700 to 900 submissions of insects each year under these programs. This position also assists the Plant Quarantine Branch by identifying insects and other arthropods that are intercepted at the ports of entry.

Pest Control Aid/Technician II and III:

Taxonomy (Pest Control Aid/Technician III): In the history of Plant Pest Control Branch there has only been a single entomologist. Historically the taxonomist had a technician that assisted in the routine technical work. This position was lost in 1998 due to retirement. Subsequently, funding issues prevented the filling of the position and eventually the position was cut outright. Sample preparation is essential for identification. Without a technician all sample preparation, maintenance of the laboratory and reference collection (both books and archival specimens) falls on the entomologist. The technician allows the entomologist to be more efficient, increasing capacity and output. As accurate and timely identification is essential so that decisions can be made on actions to be taken with infested commodities being held at ports of entry to the State. The identifications are also critical to support the scientific research that the branch conducts in it's biological control program as well as to determine whether organisms found in the State are new to the State and to make decisions on actions that need to be taken on these new finds.

Plant Pathology (Pest Control Aid/Technician II): Historically, the Plant Pathology Unit consisted of one plant pathologist and one Aide/Technician. While the Plant Pathology containment facility represents the highest level of containment present in Hawaii, its design and age has increased the amount of maintenance required to keep the facility operational and meeting Federal containment guidelines. This has detracted from the work time available for projects such as field survey or biocontrol testing. The position will allow for increased efficiency and productivity of the pathologist.

Clerk Typist II:

The Plant Pest Control Branch does not have any clerical positions and has been relying on help from clerical staff at the division level and in other branches to meet our needs. This position will provide typing and clerical support to the branch by conducting the filing, time sheets, travel arrangements, purchase orders, inventory, equipment and supplies ordering, and performing receptionist duties.