

HISC FY11 ANNUAL REPORT
Established Pests Working Group

Title: Hawaii Department of Agriculture Biological Control Foreign Exploration.

Awarded to: HDOA Plant Pest Control Branch

Background:

The primary mission of the HDOA Plant Pest Control Branch is to provide a favorable environment for agricultural development in Hawai'i and to protect the natural environment from invasive species by eradicating and controlling 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 for early detection, rapid response, containment, and eradication/control of plant pests, including insects and mites, molluscs, weeds, and plant pathogens.

HDOA's Biocontrol Program has effectively controlled many invasive pests in Hawaii which were not amenable to control by other means. This proposal requested funding for PPC foreign exploration and operations to address some of PPC's primary biocontrol targets, particularly fireweed, maile pilau, fountain grass, banana aphid, Miconia, and small hive beetle.

Project Objectives:

- Two foreign exploration trips for natural enemies of HDOA target species. One trip in Africa (fireweed, fountain grass, and small hive beetle) and one in SE Asia (banana bunchy top disease, melon fly, and maile pilau). Each trip will be approximately 2-3 months in duration and will involve searching for and onsite field evaluation of insect and pathogen natural enemies of the HDOA target pests in those regions.
- Potential candidate natural enemies will be brought back to the HDOA Containment Facilities for further research and evaluation to determine potential effectiveness and host specificity.
- Investigate feasibility of *Ditylenchus* nematodes (currently in the HDOA Containment Facility) and the fungus *Coccidiella miconiae* or other *Coccidiella* species to control *Miconia* and *Clidemia*.

Funding Received:

HISC awarded \$77,000 for FY11 towards this grant request. However HDOA did not receive the funds from HISC until May 2011 leaving us with one month to spend the money. This made it impossible to fully meet the objectives particularly the foreign exploration. As such, \$22,000 was spent and the remaining \$55,000 will be carried over into FY12.

Accomplishments:

Foreign Exploration: The HISC funding was not used for foreign exploration due to the fact that the money was received at the end of the fiscal year. However, the HISC funds were used for research and evaluations of natural enemies which were in the containment facility. The HDOA/PPC Exploratory Entomologist traveled to Thailand and Laos from October to December 2010 to search for biocontrol agents of the skunk vine or 'maile pilau' (*Paederia foetida*). An encroaching and invasive weed in Hawaii, 'maile pilau' smothers shrubs, trees, and native flora in dry to wet forests. Moreover, the weed inhibits the growth of perennial crops and encroaches landscapes readily in moist to wet areas. Several plant-

feeding insects and three pathogens infesting 'maile pilau' and other species of *Paederia* were collected and quarantined at the HDOA Containment Facilities in Honolulu. The insects are the leaf-tying moth (Lepidoptera: Crambidae), hawk moths (Lepidoptera: Sphingidae), herbivorous rove beetle (Coleoptera: Staphylinidae), chrysomelid leaf beetle (Coleoptera: Chrysomelidae), sharpshooter leafhopper (Hemiptera: Cicadellidae), and leaf-sucking lace bug (Hemiptera: Tingidae). The pathogens are *Colletotrichum gloeosporioides*, *Pseudocercospora paederiae*, and *Endophyllum paederiae*. Tests are currently being undertaken to evaluate their efficacy for suppression of the noxious weed and potential risks they may pose to non-target organisms in the natural habitat. (see Attachments 1 & 2)

Support for ongoing biological control projects:

These HISC funds were also used to culture, disseminate, and conduct post-release field evaluations of natural enemies to control the nettle caterpillar and the erythrina gall wasp.

(a) The stinging nettle caterpillar (*Darna pallivitta*) which was first recorded in September 2001 in Panaewa in Hilo on the Big Island of Hawaii has spread to Maui, Oahu, and recently, Kauai. A pest of high value plants, including, ornamental palms, pasture grasses and indigenous flora, it is equally harmful to people who may come in contact with the spiny caterpillar because of skin allergies that may result from its sting, such as, itchy rashes, burning sensation, or welt formations. In 2004, a natural enemy of the nettle caterpillar, a parasitic wasp (*Aroplectrus dimerus*), was collected in Taiwan. Determined to be host specific to the nettle caterpillar, HDOA commenced to liberate the wasp on Oahu and neighbor islands in April 2010. To date, as many as 10,000 parasitoids have already been propagated at the HDOA Insectary in Honolulu and released on the islands where pest infestations have been detected or reported by nurseries, residents, and other stakeholders. Field evaluation of the biocontrol agent is ongoing on 5 experimental sites located in Kipapa Gulch (Central Oahu) and Waimanalo (East Honolulu), Umauma and Kurtistown (Hilo) on the Big Island, and Maliko Gulch (Ulumalu) on Maui. Foliage crops, such as, *Dracaena*, ti, and areca palms, or guinea grass are cultivated commercially or growing in the wild on the sites. Quantitative information on the larval parasitism of the pest caterpillar as well as moth abundance using traps baited with lures are currently being generated to evaluate the efficacy and performance of *A. dimerus* against the target pest.

(b) The erythrina gall wasp (*Quadrastichus erythrinae*) was accidentally introduced into Hawaii in April 2005. Gall wasp infestation results in the swelling of tissues and gall formations on young shoots and twigs of affected trees. Consequently, hundreds of erythrina trees including *Erythrina variegata* and *E. crista-galli* as well as the native 'wiliwili' (*E. sandwicensis*) were severely damaged and almost decimated. *Eurytoma erythrinae* is the natural enemy of the erythrina gall wasp that was collected in Tanzania, East Africa in 2006. Quarantined in HDOA Insect Containment Facility in Honolulu, the biocontrol agent was determined to be highly specific to the gall-forming wasp and did not pose potential risks to the native fauna. Subsequently, it was introduced in Hawaii in November 2008. Currently, the parasitoid has been successfully established in the major island chain including Oahu, Maui, Big Island, Kauai, Molokai, Lanai and Kahoolawe. Moreover, as high as 90% mortality of the pest wasp has been attributed to parasitism by the biocontrol agent. From all indications, the eurytomid parasitoid has effectively thwarted the continuous onslaught and near decimation of the erythrina trees and native wiliwili throughout the State. Consequently, trees have commenced to bounce back with lush, robust, green foliage and much reduced galling. In addition, trees have started to flower and produce pod-bearing seeds. Field evaluation and monitoring of the introduced natural enemy is ongoing.

