**Final Report**
**Hawaii Invasive Species Council**
**Research and Technology Program**
**PCSU contract 54004**

**Project Title: Quarantine testing of an insect for biocontrol of *Tibouchina herbacea***

HISC Funds: $28,075

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**Summary of project**
The flea beetle *Syphraea uberabensis* for this project was exported from Brazil and received at the Volcano quarantine facility under USDA-APHIS-PPQ 526 permit #69048 on 15 July, 2005. A colony has been maintained for the for the last two years in quarantine by Steven Souder, who is pursuing studies of *S. uberabensis* for his MS thesis in the UH Hilo TCBES program. Steve refined rearing techniques for a steady supply of insects for experimental studies. He was assisted by student assistants hired under this project. The insect colony remains vigorous with no problems from disease or natural enemies over the past 2 years. Specificity tests of adult and larval *S. uberabensis* were completed in December 2007, and the data have received preliminary analysis.

Timeline of this project was modified to accommodate the schedule of the MS degree candidate, with his final thesis expected in mid-2008. Write-up of specificity testing and other studies will be incorporated in manuscripts for publication and a release petition later in 2008. Details of specific accomplishments of this project as of December 2007 are noted below.

**Project Goals:**
**1)** Test the host specificity of *Syphraea uberabensis* for the biological control of *Tibouchina herbacea* to ensure that it poses minimal risk to other plants in Hawaii.
**Accomplishment:** A total of 36 plant species were tested, beginning with many of the naturalized melastomes found in Hawaii and including representatives of other related plant families (Myrtaceae, Lythraceae, Onagraceae, Combretaceae, Thymelaeaceae) and some unrelated species. All tests indicate that host range of this insect is restricted the family Melastomataceae. In particular, expected host range in Hawaii, based on ability of the insect to feed and reproduce under quarantine conditions, includes *Tibouchina herbacea*, *Tibouchina longifolia*, *Pterolepis glomerata* and *Melastoma candidum*, all of which are weeds in Hawaii. Less suitable potential hosts are *Heterocentron subtriplinervium*, *Dissotis rotundifolia* and *Tetrazygia bicolor*. Although occasional

nontarget feeding may occur on some non-melastomes, no plants outside this family are expected experience significant damage from this insect. Native and endemic plants appear very unlikely to experience direct adverse effects from *S. uberabensis*.

**2)** Carefully screen *Syphraea uberabensis* to eliminate parasitic and pathogenic hitch-hikers from Brazil.

**Accomplishment:** We transferred adult insects to fresh plant material and initiated our lab colony with newly deposited eggs. Potential natural enemies encountered in the initial shipment included nematodes and a fungus, possibly *Beauvaria bassiana*, a common pathogen already occurring in Hawaii. No evidence of parasitoids or predators was encountered. Pathogens appear to have been eliminated, with continuous monitoring of the colony over the last 2 years showing no signs of disease in adults or larvae.

**3)** Evaluate developmental host range by exposing first and third instar larvae to non-target plants and *Tibouchina herbacea* controls in no-choice (starvation) tests, and score insect survival and damage to plants.

**Accomplishment:** First instar test results paralleled those of the adult tests – species most suitable for development of *S. uberabensis* are *Tibouchina longifolia*, *Pterolepis glomerata*, *Tibouchina herbacea* and *Melastoma candidum*. Non-melastomes did not support larval development. An interesting discrepancy between results of adult tests and larval tests occurred with the melastome *Arthrostema ciliatum*, which supported some larval development but was not attractive to adults. We modified our plan to test third instars in favor of pursuing more detailed studies of adult behavior and multi-generational rearing of insects on potential hosts. These additional tests will be completed in the next few months and will be included in the final write-ups for publication and release petition.

**4)** Test adult preference for feeding and egg-laying under choice (*Tibouchina herbacea* present) and no-choice (*Tibouchina herbacea* absent) situations.

**Accomplishment:** No-choice tests of feeding by young and mature adults and egg-laying by mature adults indicate a relatively tight association between *S. uberabensis* and the target weed plus a few other melastomes (see Figure 3). Mature adults exhibited the most restricted host range. Naïve adults, newly emerged from pupae and without any previous adult experience on plants, fed most on a range of melastomes and slightly damaged a few non-melastomes. Small amounts of initial feeding by naïve and mature adults occurred on *Terminalia catappa* (tropical almond, false kamani), but this plant, which is not closely related to melastomes, was not suitable for egg laying or larval development. Host preference for adults given a choice between *Tibouchina herbacea* and other melastome hosts has not yet been examined.

**5)** Replicate all tests a minimum of four times.

**Accomplishment:** This objective has been met in all tests and appears to be a suitable level of replication.

**6)** Summarize data from quarantine tests and combine it with results of biological studies completed in Brazil in a petition for release.

**Accomplishment:** As in quarantine tests, in Brazil the insect has only been found attacking a few close relatives of *Tibouchina herbacea* in the field. Our MS student has completed, but not yet analyzed an experiment rearing the insect in environmental chambers at a range of constant temperatures to determine development times in different environments. These indicate that immature *S. uberabensis* survive and develop at constant temperatures of 20-28 C and that development at lower temperatures is delayed. These data are consistent with observations in Brazil, where *S. uberabensis* survives but remains inactive during winters with occasional freezing. These data suggest that climate will not be a significant limitation to population growth of this insect in Hawaii.

**7)** Incorporate data on the host specificity of *Syphraea uberabensis* into the petition for release.

**Accomplishment:** Final summarization of host specificity data is expected over the next few months. These will be drafted in a format suitable for inclusion in a release petition.

**8)** Submit a formal petition for release to the Hawaii Department of Agriculture and USDA-APHIS within one month of completion of tests in quarantine.

**Accomplishment:** This objective is not expected to be met until late 2008, because we plan to include additional data from the student's thesis in the petition. In particular, analysis of potential natural enemies of *S. uberabensis* is the objective of field studies planned for 2008. While natural enemies are expected not to be a significant barrier to successful biocontrol by this agent, this analysis is important for strengthening the release petition.

**9)** Submit host specificity and other biological data for publication in a peer-reviewed journal such as "Biological Control."

**Accomplishment:** No manuscript has been produced yet, but we expect two: one describing results of host specificity tests, and another manuscript with detailed biology of *S. uberabensis* will be completed in 2008.

Figures 1 and 2. Feeding damage by adults and larvae of *Syphraea uberabensis* on the host plant *Tibouchina herbacea*.

Figure 3. Results of specificity tests with adult *Syphraea uberabensis*. Feeding damage was assessed on a scale of 0 (no damage) to 6 (>4 $cm^2$ of leaf area damaged). Oviposition tests recorded number of eggs laid by two mature females in 4 days.