Cactus Moth Detection and Monitoring Network on Public and Private Lands in the United States. A partnership between USDA-APHIS, USGS, and Mississippi State University
Progress Report January 2009 (including activities in December 2008)

Webpage: http://www.gri.msstate.edu/cactus_moth

*Introduction***.** Cactus moth (*Cactoblastis cactorum*), one of the most successful biological control agents in history, has been transported around the world in various prickly pear cactus control programs. By 2002, free-living populations of the moth had spread from the Florida Keys to the Florida Panhandle and South Carolina. It now poses a serious threat to native prickly pear cactus populations in the American Southwest, as well as the cactus industry and desert ecosystems in Mexico.

A research, extension, and coordination effort to monitor the spread and develop integrated control of cactus moth has been developed as part of collaborative research between USGS and Mississippi State University, with assistance from USDA-APHIS. This project has the following components: Early Detection and Reporting of Cactus Moth, Distribution of Prickly Pear Cactus, in the Region, Modeling of *Opuntia* Distribution, Cactus and Cactus Moth Extension Information, Web-Based Database of Cactus and Cactus Moth Locations, and Regional Coordination

I. Early Detection and Reporting of Cactus Moth. Task Description: Cactus moth detection techniques will be tested to find an optimal approach for detection, and a network of detection sites at known cactus locations will be implemented. The MSU insect collection will develop instructional information for potential volunteer monitors at the selected monitoring sites, and provide for moth species verification and vouchering.

Summary of Objectives:
1. Develop and test techniques for (a) detecting cactus moth infestations, (b) delimiting infested areas, and (c) determining effectiveness of control actions.
2. Develop a cactus moth detection network in the project area.
3. Develop protocols for monitoring native and ornamental cactus populations.
4. Develop protocols for reporting and verifying suspected cactus moth infestations.

Progress this month:
- Screened 92 pheromone traps from Arizona (66: Gila, Maricopa, Pima, and Pinal Cos.), California (26: no data), and Mississippi (8: Grand Bay NERR); all were negative.
- Research on external anatomy of de-scaled adults of cactus moth and *Melitara prodenialis* completed.
- Standard Operating Procedures and description of the insect rearing facility in Clay Lyle Entomology were written and submitted to obtain a permit as a quarantine facility for rearing cactus moths.

II. Distribution of Opuntia *in the Region.*
Task Description: MSU staff, natural resource agency professionals, and volunteers will be used to search for populations of *Opuntia* cactus in the region. Native cactus populations will be located using herbarium records, contact of federal, state, and NGO biologists, and surveys. The location and description of all *Opuntia* cactus populations in the region and of cactus moth monitoring sites will be placed on a web-accessible database, as part of extension efforts listed below.

Summary of Objectives:
1. Develop and test methods to locate and map populations of cactus in support of surveys to detect and delimit cactus moth infestations in the region
2. Utilize professionals and volunteers to survey cactus locations in the Southeastern region.

Progress this month:
- Travis Marsico established six long-term study plots in the Florida panhandle for investigating the dynamics of *Cactoblastis* and *Melitara* infestations in native *Opuntia*.

III. Modeling of Opuntia *Distribution in the Region.*
Task Description: We will develop spatial models to predict cactus distribution in a GIS framework.

Summary of Objectives:
1. Develop cactus distribution prediction models

Progress this month:

- Gary Ervin and Christopher Brooks revisited the Argentinean range of *Cactoblastis cactorum* to collect additional ecological data and specimens for DNA analyses. They traveled almost 3,000 miles through the peripheral provinces of northern Argentina, visiting a total of ten provinces, five of which were not visited in their February expedition. Approximately 60 new collections were made, which are believed to include at least three additional species of cactus-feeding Lepidoptera. This trip was conducted with the assistance of USDA SABCL scientists Dr. Guillermo Logarzo and Laura Varone.

IV. Cactus and Cactus Moth Extension Information.
Task Description: We will develop web-based information to aid in the identification of cactus and the cactus moth.

Summary of Objectives:
1. Web-based educational materials on cactus and the cactus moth
2. Educational program on cactus moth, including on-line and printed fact sheets and brochures.

Progress this month:

- Screening guide with information on cactus moth and identification key was translated to Spanish for future dissemination in Mexico.

V. Web-based database for cactus and cactus moth distribution.
Task Description: We will develop a web-based avenue for reporting suspected locations on the web, and web GIS database to display the movement of the moth and locations of natural cactus populations. Webpage: http://www.gri.msstate.edu/cactus_moth

Summary of Tasks:
1. Operational web database for locating and mapping cactus and cactus moth populations.

Progress this month:

- Maintained the CMDMN system including adding new users

VI. Coordination.
Task Description: A collaborative project of this size involving multiple agencies requires a concerted effort to coordinate activities and agree on the tasks to be done and data to be collected.

Coordination activities this month:

- Cliff Abbott attended the NBII Developers Conference in Denver
- Participated in the January 2009 Invasive Species Working Group teleconference

Accomplishments

- A grant proposal was submitted to the National Science Foundation to develop molecular genetic tools for studies of *Opuntia* and cactus-feeding moths. Gary Ervin, with Travis Marsico (Ervin post-doc), four other Biological Sciences faculty (Lisa Wallace, Mark Welch, Chris Brooks, and Vincent Klink), and Richard Brown submitted a proposal entitled "Using ecological genomics to investigate the role of host-parasite co evolution in species invasions."
- Lucas Majure published his work on the *Opuntia* of Mississippi. The citation is: Majure, L.C. and G. N. Ervin. 2008. The *Opuntia* (Cactaceae) of the state of Mississippi, United States. Haseltonia, 14: 111-126.

For more information, contact: Dr. John D. Madsen, ph. 662-325-2428 or jmadsen@gri.msstate.edu