



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

October 2005 Progress Report

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, 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:

- Identified specimens for 42 pheromone traps from Arizona; all were negative for *Cactoblastis cactorum*.
- Completed study of larval sensory structures of *Cactoblastis* and *Melitara prodenialis* with Gerry Baker. SEM examinations revealed significant differences in structure of sensory structures on labrum, antenna, and maxilla of the two species. A new morphological organ was discovered on the head in both species. Images of this structure were sent to Lepidoptera systematists and morphologists throughout the U.S. and selected other countries, but nobody has seen anything like it in other Lepidoptera larvae.

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. We will also develop a spatial model to predict cactus distribution in a GIS framework.

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.
3. Develop a cactus distribution prediction model

Progress this month:

- Continued mapping and data collection in northern and central Mississippi.
- Mapping and data collection trip to central and northwest Arkansas
- Re-visited sites in coastal Mississippi for the first time since Hurricane Katrina. *Opuntia* populations located slightly inland near Katrina eye-wall were still present. However, those near the beach may be gone. More validation needed for populations near Hwy 90 and barrier islands and shell middons are needed. At least one population of cactus was eliminated from Grand Bay NERR.
- Continued data analyses from *Opuntia* field study.
- Began efforts at molecular analysis of putative *Opuntia humifusa* × *pusilla* hybrid.

III. 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:

- Final revisions of prickly pear and cactus moth materials completed and submitted to MSU-Extension Service for approval and publication. These new versions are available as draft documents on the webpage, http://www.gri.msstate.edu/cactus_moth.

IV. 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.

Summary of Tasks:

1. Operational web database for locating and mapping cactus and cactus moth populations.

Progress this month:

- Arc-IMS mapping has been improved, and will soon display verified populations of cactus moth.

V. 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:

- Abstract accepted (Assessing habitat requirements for host plants (*Opuntia* spp.) of *Cactoblastis cactorum* in the Southeastern United States) for the ESA International conference in Merida, Mexico.
- Invited to participate in planning for the Consortium of Regional Ecological Observatories (COREO) Domain 8, which is part of the National Ecological Observatories Network (NEON) planning groups.

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