



MISSISSIPPI STATE UNIVERSITY



Cactus Moth Update



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Pricklypear Cactus Surveys in the MidSouth

By Victor Maddox, MSU Geosystems Research Institute

Host and pest surveys were conducted in AL in April, MS in May and LA and TX in June. During an eight day survey trip in LA and TX on June 3-10, 407 host reports were collected primarily along the southeastern coast of TX. Some areas along the north shore of Lake Pontchartrain, LA, were also surveyed during the return from south Texas, particularly south of Covington, LA. However, most areas were heavily developed and negative for host. Only a limited amount of time was spent surveying this area and it is possible that host exist in more remote areas near Lake Pontchartrain.

Most were positive reports (247), but negative reports (160) were also collected par-

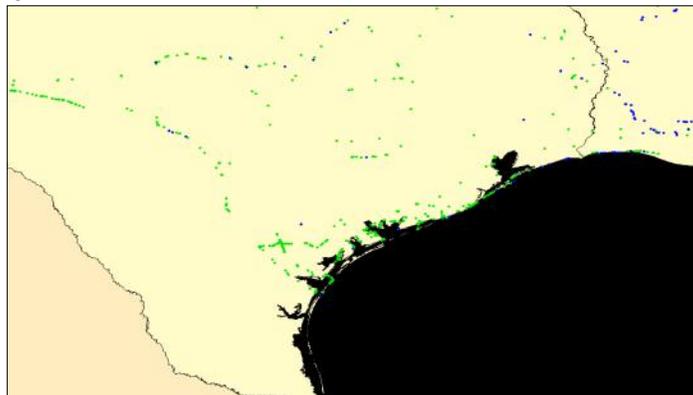


Fig. 1. *Opuntia ficus-indica* (L.) Mill. is an example of cultivated *Opuntia* observed during the surveys in southern Texas (Photo by Victor Maddox, MSU-GRI).

ticularly in strategic areas to prevent duplication and provide host distribution insight. Host species included *Opuntia cochenillifera* (L.) Mill. [Syn. *Nopalea cochenillifera* (L.) Salm-Dyck], *O.*

ellisiana Griffiths, *O. engelmannii* Salm-Dyck ex Engelm., *O. ficus-indica* (L.) Mill., *O. humifusa* (Raf.) Raf. and *O. leucotricha* DC., but *Opuntia engelmannii* (Fig. 1) was the most prevalent along the coastal dunes and had the highest plant count during the surveys. New host counties were added to the Cactus Moth Detection and Monitoring Network database for Texas during these surveys. Host survey data from the trip is currently being added to the CMDMN database and close to 200 of the over 407 host reports have been added as of 30 June 2010 (Fig. 2). Much of the negative data is still being entered. Additional surveys in southern Texas are planned for July, 2010. These will most likely provide new distribution information about the host in southern TX.

Fig. 2. Host map as of 30 June 2010 from the Cactus Moth Detection and Monitoring Network showing georeferenced data form points in southern Texas.



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Integrating Environmental Modeling and Population Genetics to Better Understand the Success of *Cactoblastis cactorum* Invasion

Gary N. Ervin,
MSU Department of Biological Sciences

Our current work encompasses three major areas of research – environmental modeling based on data from the *Cactoblastis cactorum* native range, genetic studies of *Opuntia* and cactophagous moths, and experimental studies of growth performance of *C. cactorum* and native US cactus moths on native southeastern US *Opuntia* species.

One manuscript reporting results of our environmental modeling work has been submitted for review, and another is nearing completion. Both papers form the basis for a grant proposal being submitted to NSF in collaboration with USDA-ARS scientists. Details from those papers and grant proposal will be included in the September report and are being presented by Dr. Chris Brooks at the Ecological Society of America conference in Pittsburgh, PA (co-authored by

Gary Ervin), and by Brooks and Ervin at the Entomological Society of America conference in San Diego in December.

We have completed one series of growth chamber experiments, with the native moth, *Melitara prodenialis* taking almost a full year to complete its life cycle (egg to adult) in the laboratory (Figure 1). A second series of these experiments has been initiated by Dr. Travis Marsico, at Arkansas State
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We have completed one series of growth chamber experiments, with the native moth *Melitara prodenialis* taking almost a full year to complete its life cycle (egg to adult) in the laboratory.

President of MSU and Vice-President of Agriculture Visit Cactus Moth Quarantine Facility

Richard Brown,
MSU Department of Entomology and Plant Pathology

Dr. Mark Keenum, President of Mississippi State University, and Dr. Gregory Bohach, Vice President of Agriculture, visited the Insect Rearing Facility in the Clay Lyle Entomology Building on June 8. During the tour of the Cactus Moth Quarantine Unit, Richard Brown provided an overview of the cactus moth, and Gary Ervin and Chris Brooks reported on their collaborative research with Travis Marsico, Lisa Wallace, Mark Welch, and Anastasia Woodard. Posters on genetic diversity within native ranges of *Melitara prodenialis* and *Cactoblastis cactorum* and on differential defense response of cactus to these two species were displayed.



Fig. 1. Dr. Gregory Bohach, left, and Dr. Mark Keenum, right, in insect rearing facility. Photo by Kat Lawrence, MSU Ag Communications.

Integrating Environmental Modeling and Population Genetics to Better Understand the Success of *Cactoblastis cactorum* Invasion, cont.

University, with similar results. Assisting with those studies is former Mississippi State undergraduate, Anastasia Woodard. Anastasia now is beginning graduate studies under the direction of Marsico. Marsico will be presenting results from this work at the Ecological Society of America conference in Pittsburgh, PA (co-authored by Gary Ervin). The growth chamber experiments also were part of a June 8th tour of the Lyle Entomology insect rearing facility, given to the MSU President and the Vice President for Agriculture, Forestry, and Veterinary Medicine. This aspect of the tour was led by Drs. Richard Brown, Chris Brooks, and Gary Ervin; Brown gives more details in a separate report.

We recently received a shipment of 41 additional collections of cactus-associated moths and larvae from Argentina. These are part of an ongoing collaboration with USDA-

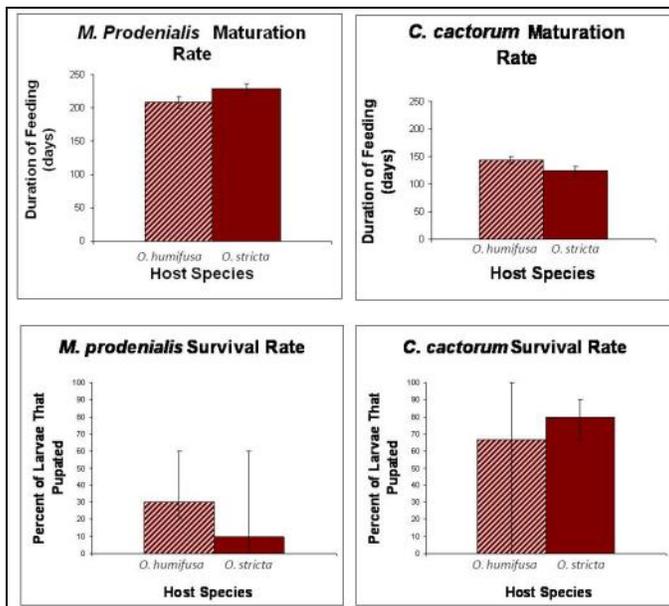


Figure 1. Some of the results from growth chamber experiments; these were presented as an undergraduate research project. The native *Melitara prodenialis* tended to mature much more slowly and have lower rates of survival than did *Cactoblastis cactorum* in our rearing facility experiments.

ARS scientists and will be used to better understand the biology of *C. cactorum* in its native range and as part of the NSF

proposal in development. These collections have undergone DNA sequencing, and are being compared with our previous collections (Fig. 2). Thus far, results from these analyses concur with our previous collections, with the added benefit that we have obtained collections of at least one additional *Cactoblastis* species (*C. doddi*), which feeds on a different suite of cactus species than does *C. cactorum*. We anticipate this additional manuscript being completed over the next six months.



Figure 2. Freshly ground *C. cactorum* larvae from Argentina, awaiting analysis to determine genetic haplotypes for an ongoing project in collaboration with USDA-ARS scientists in the US and Argentina.

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Hurricane *Cactoblastis*?

By Clifton Abbott,
MSU Geosystems Research
Institute

Warning! Hurricane *Cactoblastis* is likely to make landfall on the gulf coast early next week. *Cactoblastis* is a minimum Category 3 hurricane punching winds of 115 mph. This storm carries the potential to spread the cactus moth to several states.

Yes, this scenario may sound silly. However, it demonstrates a real possibility. Hurricanes have the potential to pick up debris and deposit it hundreds of miles away. The likelihood of a storm picking up an infected cactus pad or a flying moth is strong given the right conditions.

This year, the hurricane predictions have a large number of major storms hitting the U.S. Given the cactus moth's current locations along the southern Atlantic coastline, throughout all of Florida, and along the gulf coast into Louisiana, the chances of an infestation being

in the path of a major storm are high.

Efforts to eradicate infested cactus plants along the gulf coast have been under way since 2005. Yet, cactus moth populations still seem to be spreading west along the coast. In all of the efforts to eradicate the infestations, there are always some that get missed. Whether it is the lack of manpower to search for cactus locations, or the ability to get to the areas where the infestations are located, many get missed.

Another unknown this year is the effect of the oil spill in the gulf. If a major storm comes and the oil is left on the cactus pads, what effect will it have on the cactus plant? Will it kill off the plant, thus removing potential future moth infestations? Will the plant live but become an undesirable host for the moth? Will the oil kill off current moth infestations? Will the oil spill end up being a positive thing with respect to the fight

against the cactus moth? These are all questions that can only be answered by locating the cactus and inspecting infestations.

How can I help? I'm glad you asked. Volunteers are needed to locate cactus locations along the gulf coast. When these cactus locations are found, they can be inspected for the presence of the moth. The plant location is then stored and mapped so that it can be revisited later. Information is also recorded about the presence of the cactus moth, or the lack thereof. If the cactus is located in the leading edge of the moth's progression, you can volunteer to set up a sentinel site, or a site that you go back and inspect at regular intervals. A few months after a strong storm, you can volunteer to revisit known cactus locations for inspection. Your help is needed. For more information, please visit http://www.gri.msstate.edu/cactus_moth.

**The likelihood
of a storm
picking up an
infected cactus
pad or a flying
moth is strong
given the right
conditions.**

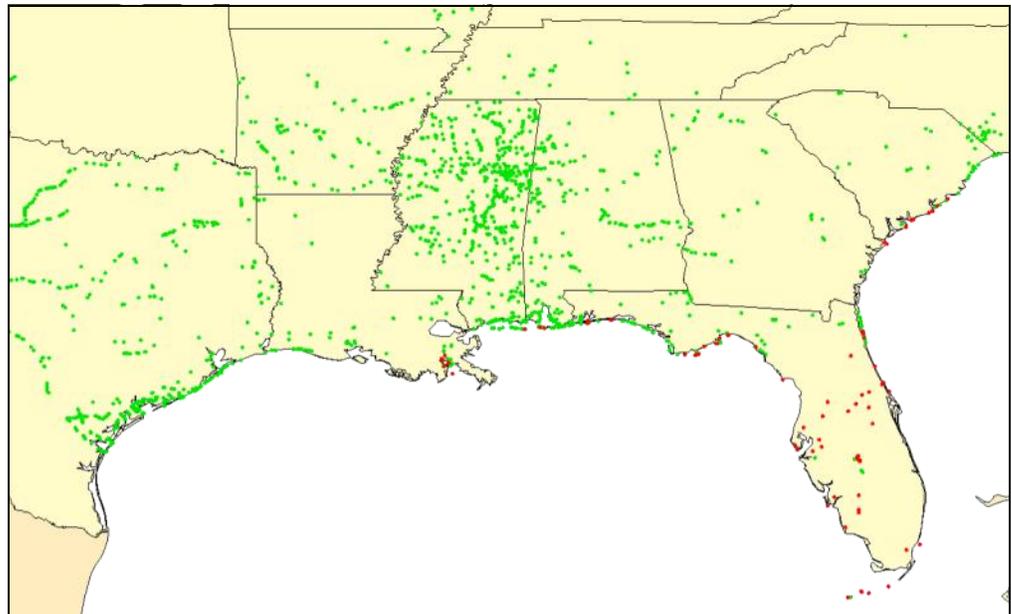


Figure 1. Positive cactus moth locations (red dots) with known pricklypear cactus populations (green dots)



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[www.gri.msstate.edu/
cactus_moth](http://www.gri.msstate.edu/cactus_moth)

Publications April—June 2010

In-House

Madsen, J. D., Brown, R. L., Ervin, G. N., Shaw, D. R., Abbott, C. F., Maddox, V. L., Wersal, R. M., McBride, D. W., & Madsen, N. 2010. Research to Support Integrated Management Systems of Aquatic and Terrestrial Invasive Species. GRI#5039. Mississippi State University: Geosystems Research Institute. 41pp.

Presentations

Woodard, A. M., T. D. Marsico, and **G. N. Ervin**. 2010. Evaluating Differential Defense Response In Two Native Cactus Species. Mississippi State University Biology Undergraduate Research Symposium, Mississippi State, MS, April 16, 2010.

Leveraging Grants and Partnerships

Madsen, J.D. and V.L. Maddox. 2010. Cactus Moth Response West of Mississippi: Survey, Training, and Verification. USDA APHIS PPQ, March 15, 2010 – March 31, 2011. \$30,000.

Collaborations

Gary Ervin and Chris Brooks were invited to present their research in an organized symposium entitled "The Multiple 'Personalities' of *Cactoblastis cactorum*: A Multi-Disciplinary Response to the Biological Impacts of the Moth's Geographical Wanderings" as part of the annual meeting of the Entomological Society of America, 12-15 December 2010 in San Diego, CA.

Maddox, V. Participated in cactus moth survey with USDA-APHIS on Mississippi Barrier Islands, 1-3 Feb 2010.

Maddox, V. Participated in cactus moth survey with USDA-APHIS on Mississippi Barrier Islands, 9-12 Mar 2010.

Maddox, V. Participated in Cooperative Agricultural Pest Survey meeting. 20 May 2010. Bureau of Plant Industry Building, Mississippi State, MS.

Maddox, V. Provided a 5 min MSU cactus moth project update during a USDA teleconference call hosted by USDA-APHIS on 24 May 2010 for the United States and Mexico.

Madsen, J.D. North American Invasive Species Network. Organizing Committee Teleconference, April 19, 2010.

Madsen, J.D. North American Invasive Species Network. Organizing Committee Teleconference, May 24, 2010.

Madsen, J.D. North American Invasive Species Network. Organizing Committee Teleconference, June 25, 2010.