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Cactus Moth Update



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Undergrad Student Examines Larval Morphology of *Cactoblastis cactorum*, in Reference to Published Work from the Native Range

By Gary Ervin
Department of Biological Sciences

Undergraduate student Brice Lambert recently completed a study in which he examined pigment patterns of *Cactoblastis cactorum* larvae, in a comparative study of North American (Florida) versus South American (Argentina) specimens (Fig. 1). Late-instar larvae from both regions were grouped based on published morphological work from MacFayden (1985) and then compared to the recently published genetic work of Marsico et al. (2011).

Brice found that all the Florida specimens examined could be grouped into a single morphological category (Fig. 2), whereas our collections from Argentina were classified into one of two groups (out of five groups described by MacFayden 1985). This finding agrees with the genetic analyses that placed all North American specimens into a single mitochondrial DNA haplotype group from eastern Argentina (Fig. 2; Marsico et al. 2011).

Brice has presented this work at the regional Southeastern Ecology and Evolution Conference (SEEC), at Auburn University, as well as at the April 2011 MSU Biology Undergraduate Research Symposium, where he won 3rd place for his work and



Figure 1. MSU undergraduate Brice Lambert examines *C. cactorum* larvae to observe pigmentation patterns as part of his research project.

presentation. Brice plans to present this work once more, at the university-wide Undergraduate Research Symposium. This summer, Brice will be working on a growth chamber study aimed at comparing growth and survival of *C. cactorum* on *Opuntia* species collected in 2010

from across the Louisiana and Texas Gulf Coasts.

References

McFayden, R. A. 1985. Larval characteristics of *Cactoblastis* spp. (Lepidoptera: Pyralidae) and the selection of species for biological control of

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Undergrad Student Examines Larval Morphology of *Cactoblastis cactorum*, in Reference to Published Work from the Native Range, cont.

prickly pears (*Opuntia* spp.).
Bulletin of Entomological Research 75: 159-168.

Marsico, T. D., L. E. Wallace, G. N. Ervin, C. P. Brooks, J. E. McClure, and M. E. Welch. 2011. Geographic patterns of genetic diversity from the native range of *Cactoblastis cactorum* (Berg) support the documented history of invasion and multiple introductions for invasive populations. *Biological Invasions* 13: 857-868.

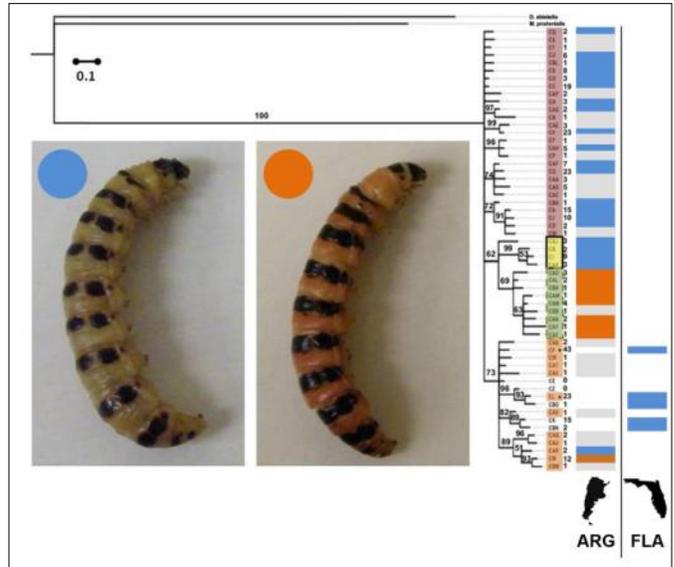


Fig. 2. Occurrence of the two morphological groups identified, based on pigment patterns (dark spots), superimposed on the phylogeographic tree developed by Marsico et al. (2011). Although both were identified in the eastern and northeastern parts of the *C. cactorum* native range (ARG), only the morphotype on the left was identified from samples collected in Florida.

A WMS (web map service) connector was added that gave the website the ability to utilize realtime maps as static images throughout the website, as well as providing data layers to online catalogs wanting to digest the cactus data.

The Cactus Moth Detection and Monitoring Network Moves Off of IMS

By Clifton Abbott
Geosystems Research Institute

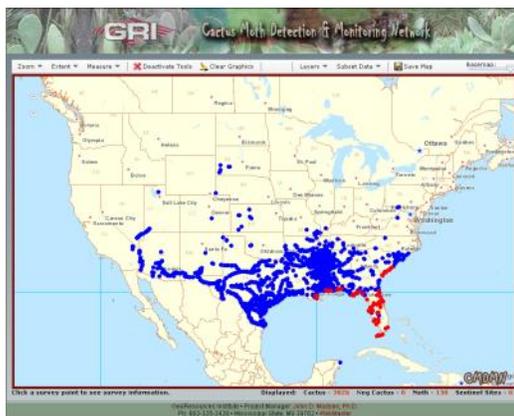
The CMDMN system has finally been moved to ArcGIS Server. The CMDMN system started out on ArcIMS v9.0 and utilized a customized map interface for its online maps. A WMS (web

map service) connector was added that gave the website the ability to utilize realtime maps as static images throughout the website, as well as providing data layers to online catalogs wanting to digest the cactus data.

With different maps being utilized in numerous places and in different ways, the transition was not a simple move. The ESRI Javascript Map API was used because of the compatibility with mobile devices.

However, some functionality that was provided with the IMS maps and that was still needed had issues that had to be worked out. Research and development was done to overcome these issues such as printing. In the end, the maps were recreated and improved upon.

Work continues on the map products provided through the CMDMN. Caching on the basemaps (the background layers providing roads and the like) is still in progress. The map cache will allow the maps to function at a much faster redraw rate. Free basemaps provided online are not typically cached at a resolution needed for CMDMN. Therefore, map caches are being built in-house to support the online maps.



CMDMN uses a new interactive map.

Cactus Moth Detection and Monitoring Network through the “Mobile Eye”

By Clifton Abbott
Geosystems Research Institute

The Cactus Moth Detection and Monitoring Network and the Invasive Plant Atlas of the MidSouth are going mobile. As more and more people go mobile, more and more web-sites and services go mobile. These two systems are no exceptions. With the purchase of an iPod Touch, we have started viewing these systems with a “mobile eye” to evaluate how these two systems fare in the mobile world. This evaluation will determine where changes are needed and where they are needed.

The CMDMN and IPAMS have already been planning for the move to the mobile world. The online maps are being provided through ESRI’s Javascript API that is compatible with mobile

devices. As these maps are viewed through the “mobile eye”, it is already clear that these maps will need to be streamlined to minimize the mouse controlled functionality as a mobile device is not controlled in the same manner. The evaluations are still in progress.

Research is also being done to look at how other sites are handling their sites with respect to mobile devices. Some sites slightly change their content on the fly if the user is a mobile user, while others send the user to a completely different site designed just for the mobile device.



CMDMN Interactive Map from an iPod Touch.

All in all, the “mobile eye” seems to be just as diverse as the normal eye.

With the purchase of an iPod Touch, we have started viewing these systems with a “mobile eye” to evaluate how these two systems fare in the mobile world.

Collaboration and Publications January through March 2011

Collaboration

Gary Ervin was invited to serve on graduate student committees at Arkansas State University (*Cactoblastis cactorum* research; doctoral dissertation) and University of Texas-PanAm (invasive grass research; Master’s thesis).

John Madsen serves on the organization board for the North American Invasive Species Network.

Peer-Reviewed Journals

Marsico, T. D., Wallace, L., **Ervin, G. N.**, Brooks, C., McClure, J. E., & Welch, M. E. (2011). Geographic Patterns of Genetic Diversity from the Native Range of *Cactoblastis cactorum* (Berg) Support the Documented History of Invasion and Multiple Introductions for Invasive Populations. *Biological Invasions*. 13, 857-868.

Fleming, J. P., Madsen, J. D., & Dibble, E. D. (2011). Macrophyte Re-Establishment for Fish Habitat in Little Bear Creek Reservoir, Alabama, USA. *Journal of Freshwater Ecology*. 26(1), 105-114.

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Although much basic information on the cactus moth has been obtained during the past 80 years, an individual egg of C. cactorum has never been photographed nor compared with eggs of other cactus feeding species, in part because the eggs are deposited as an egg stick that is covered with secretions from the colleterial gland.

Gulf Coast Connectivity and Boat Surveys in Early 2011

By Victor Maddox
Geosystems Research Institute

In early 2011, strategic road surveys were conducted in southern Louisiana and southeastern Texas to continue addressing the issue of connectivity. Connectivity could be an issue if cactus moth moved further west and found suitable host north of the coast. Connectivity does not seem to be a major issue in Mississippi and Alabama where very little inland host exists in close proximity to infested coastal host populations. However, it could be a major issue further west, particularly in Texas. Surveys were conducted in south Texas during 2010 and connectivity was identified from Corpus Christi south (Figure 1).

Following surveys in south Texas, questions remained regarding extreme southeast Texas and southern Louisiana from southwestern Louisiana to areas east and west of Lake Pontchartrain. Areas previously surveyed along the coast in Louisiana and southeast Texas were not the target of these surveys. Three separate road surveys were conducted in early 2011. Surveys from February 21 to 25 were focused

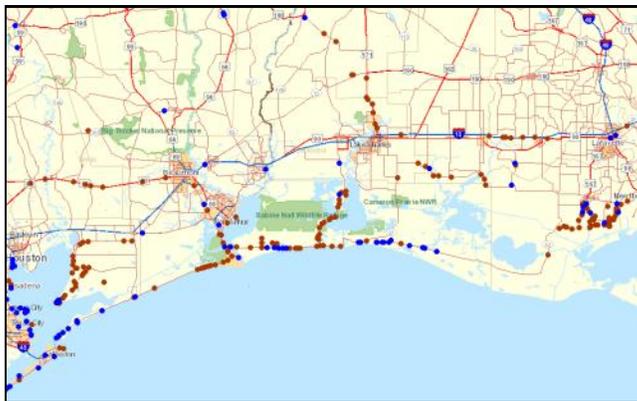


Figure 2. Cactus Moth Detection and Monitoring Network map (14 April 2011) of southeast Texas and southwest Louisiana showing the prevalence of host-absent (brown dots) over host-present (blue dots).



Figure 1. Cactus Moth Detection and Monitoring Network map of southern Texas and Louisiana showing host-present (blue dots) and host-absent (brown dots) data as of 14 April 2011.

on potential connectivity between coastal and inland host populations in southwestern LA and southeastern TX. Surveys from March 1 to 2 and March 8 to 11 were focused connectivity in south-central LA and southeastern Louisiana west of Lake Pontchartrain. Very little host was found during the three surveys, but numerous negative host reports were collected and entered into the Cactus Moth Detection and Monitoring Network database (www.gri.msstate.edu/cactus_moth) (Figure 2). Based upon these surveys, inland connectivity was not identified in the surveyed areas. No pest was found during the surveys.

Previous surveys had been conducted around New Orleans, the North Shore, and much of southwest Mississippi. In addition, regular surveys are conducted on the barrier islands in Mississippi. However, a large area near the mouth of Lake Pontchartrain and the Pearl River had not been previously surveyed. This area was only accessible by boat, so a boat survey was conducted January 31 to February 2, 2011. USDA-APHIS personnel from both Pensacola, FL and Louisiana were invited to participate in the survey. No host was found during the boat survey, although one small plant was found along Highway 90 prior to the boat survey. No pest was identified.

Work is still underway to eradicate cactus moth from southeastern Louisiana; thus, there is still a threat that cactus moth may move west. Fortunately, much more is known about host connectivity between the coast and inland Texas as a result of surveys conducted in 2010 and early 2011. However, the threat of human movement, intentional or accidental, still exists. More strategic surveys may be conducted in 2011 where needed and funds are available.



MISSISSIPPI STATE
UNIVERSITY

Geosystems Research Institute
Box 9627
Mississippi State, MS 39762-9627

Phone: 662-325-2428
Fax: 662-325-7692

E-mail: jmadsen@gri.msstate.edu



Collaboration and Publications January — March 2011

(Continued from page 3)

Marsico, T. D., L. E. Wallace, **G. N. Ervin**, C. P. Brooks, J. E. McClure, and M. E. Welch. 2011. Geographic patterns of genetic diversity from the native range of *Cactoblastis cactorum* (Berg) support the documented history of invasion and multiple introductions for invasive populations. *Biological Invasions* 13: 857-868.

Presentations

Madsen, J. D., Ervin, G. N., Wersal, R. M., & Fuller, P. (2011). Two Web-Based Databases for Invasive Aquatic Plant Locations and Information. Southern Weed Science Society 64th Annual Meeting. San Juan, Puerto Rico.

Lambert, B., G. N. Ervin, and C. P. Brooks. 2011. Comparing morphological variation to genetic variation in an invasive herbivore, *Cactoblastis cactorum* (Berg). Southeastern Ecology and Evolution Conference, Auburn University, Auburn, AL, March 25-27, 2011.

Professional Presentations

Abbott, C. F. (2011). Invasive Species Databases and Websites. Mississippi State University.

Madsen, J. D. (2011). Invasive Species Research and Extension at GRI. Mississippi - Texas Invasive Species Work Group. Mississippi State University: Geosystems Research Institute.

Ervin, G. N. 2011. Combining biological databases and predictive modeling in conservation planning. Department of Biological Sciences, Arkansas State University, Jonesboro, AR, February 16, 2011.

Lambert, B., G. N. Ervin, and C. P. Brooks. 2011. Comparing morphological variation to genetic variation in an invasive herbivore, *Cactoblastis cactorum* (Berg). Biology Undergraduate Research Program, Mississippi State University Department of Biological Sciences, April 8, 2011.

Items of Pride

Undergraduate **Brice Lambert** won 3rd place in the MSU Biology Undergraduate Research Symposium for his poster on cactus moth morphological comparisons between North America and Argentina.

www.gri.msstate.edu/cactus_moth