

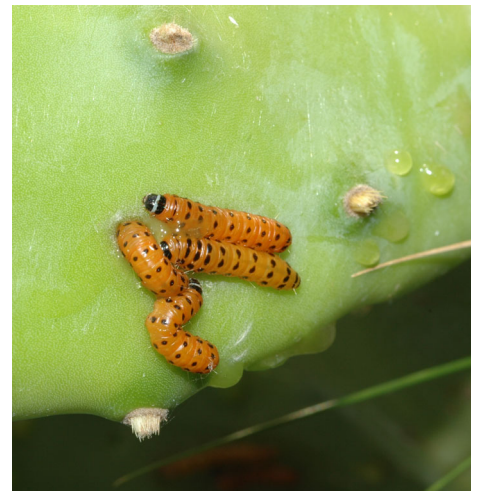
South American Cactus Moth Threatens Important North American Resource

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The survival of indigenous and rare cacti along the coastal areas of the southern United States is threatened by a spotted black-and-orange caterpillar. Once hailed as a hero in Australia for controlling unwanted populations of prickly pear cactus (*Opuntia* spp.), the caterpillar—a larvae of the South American cactus moth (*Cactoblastic cactorum*)—has quickly established itself as an American pest threatening native landscapes and agricultural industries in the southwestern United States and Mexico.

The United States Department of Agriculture estimates cactus has a trade, nursery, landscape, crop, and forage value of up to \$70 million a year, mainly in the Southwest. In Mexico, cactus is estimated to be a \$50 million to \$100 million a year industry.

Discovered for the first time in the Florida Keys in 1989, the moth has since eaten its way up the eastern seaboard just north of Charleston, South Carolina, and along the Gulf Coast to Dauphin Island, Alabama. Moving at a rate of approximately 30 to 50 miles per year through the 1990s and a rate of about 100



Top: Egg sticks of *Cactoblastic cactorum* resemble cactus spines. ►

Center: Orange and black larvae of *Cactoblastic cactorum* on *Opuntia* pad.

Bottom: Adult moth of *Cactoblastic cactorum*. Photos courtesy of Ignacio Baez, USDA Agriculture Research Service, Tallahassee, FL.

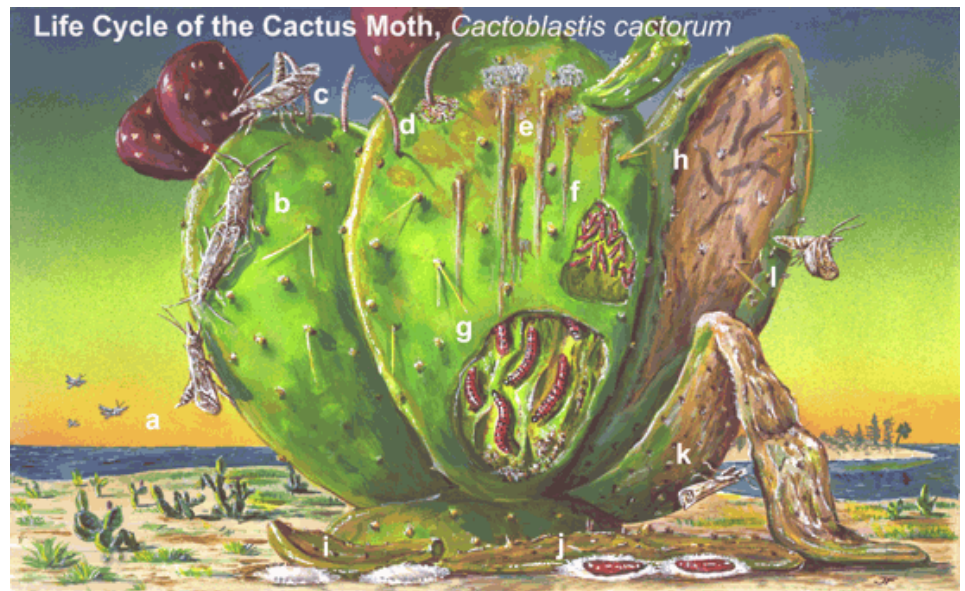
miles annually since 2000. Without any control measures the moth is expected to reach the Texas border by 2008. That timing may have been delayed somewhat by a USDA research method that includes the removal of infested *Opuntia* cactus coupled with the release of sterile cactus moths to mate with the moths infesting cactus stands at the leading western edge of the infestation.

Researchers believe the cactus moth populations are moving quickly in coastal areas due to the availability of abundant hosts on the barrier islands. Along the Gulf Coast, prickly pear host plants are available to a much lesser degree in habitats inland from infested areas.

The South American cactus moth is a relatively non-descript brownish-grey moth, that deposits its eggs onto the succulent segments of host plants such as young cactus pads. The eggs are laid in “egg-sticks” that resemble cactus spines. After hatching the feeding larvae burrow into the plant and then cause physical damage to the plant by hollowing out and destroying cactus pads. The larval damage also enables bacteria and other microbial organisms to enter the plant and cause secondary infections, which contribute to the death of the plant.

The cactus moth has been found to eat any prickly pear cactus with flat pads in the genus *Opuntia*. Chollas are sometimes included in the genus *Opuntia*, but these species are not preferred hosts of *C. cactorum*. Of the pad-forming *Opuntia*, 12 native species occur in New Mexico, 19 species in Texas, and 53 in Mexico.

If the South American cactus



(a) Before sunrise, the female moth begins to release sex pheromones signaling to males her readiness to mate. Males respond and (b) mating takes place for a short time. (c) After an incubation period, the female deposits an egg stick averaging 70-90 eggs. Egg sticks, which resemble cactus spines, develop and (d) hatch in 25 to 30 days. Gregarious first instar larvae bore into the cactus pad. The external damage (e) is characterized by yellowing of plant tissue, with oozing of plant fluids and insect frass. (f) Shown here in cross-section, larvae feed, (g) develop internally, and eventually (h) hollow out the cactus pad. Mature larvae exit the cactus pad to (i) form cocoons and pupate (j) under debris on the ground at the base of the plant. After emergence (k), adult moths disperse (l) to new areas. (Illustration by Joel Floyd, USDA, APHIS, PPQ)

moth were to become established there, potential impacts in the southwestern United States include significant ecological impacts on the Chihuahuan, as well as the Sonoran, Mohave, and Great Basin deserts. Prickly pear is a major component of these desert ecosystems. It provides habitat and food for a variety of desert-dwelling wildlife and pollinators, as well as a germination site for seeds of many native plants. A healthy desert ecosystem is important to the economy of southwestern states in providing for recreation, hunting, and ecotourism opportunities.

The importance of prickly pear to the agriculture of the United States

includes its use as emergency forage for cattle during drought years, its use as a nursery plant for low water-use landscaping and for some fruit and pad production in California and Florida for Latino consumers.

For Mexico both the ecological and agricultural importance of prickly pear is enormous. Mexico is the center of diversity for prickly pear *Opuntia* species with 35 of their 56 species being endemic. Just as significant is their country's dependence on prickly pear products such as the fruit (*tunas*), pads (*nopales*), and dye (*cochineal*) amounting to 2 percent of their agricultural output. Prickly pear in Mexico is a national symbol appearing

on their flag with a cultural identity with this plant dating back to the Incan and other ancient civilizations. The South American cactus moth is not known to occur in Mexico.

In a race against time, the U.S. Department of Agriculture's Animal and Plant Health Inspection Service (USDA APHIS) has joined forces with state departments of agriculture to survey nurseries and homeowner properties; and national parks, national wildlife refuges, and The Nature Conservancy in the southern United States to be on the lookout for prickly pear infested by the cactus moth.

To prevent the westward spread of the cactus moth, scientists at USDA's Agriculture Research Service (USDA-ARS) are investigating control options using the sterile insect technique. Believed to be the most promising control method to date, the sterile insect technique involves the release of mass-reared sterile moths to limit the reproductive capability of healthy females. The major benefit of this technique is that, unlike chemical controls, there is no adverse impact to host plants or related moth species. The sole adverse impact is on the target species—the cactus moth. USDA-ARS anticipates that the sterile insect technique, coupled with physical removal of infested prickly pear along the coast and on barrier islands of Alabama, will lower the population there to undetectable levels. The ultimate goal is to create a barrier to westward movement along the Gulf Coast, and move the leading edge back to the panhandle area of Florida.

The government of Mexico is so concerned about the potential damage

by an introduction of the South American cactus moth to their country's agriculture and *Opuntia*-rich natural resources, that the Mexican agriculture department has contributed substantial funding that matches USDA-APHIS funding for a research and implementation program along the U.S. Gulf Coast.

In addition to exploring control options for the cactus moth, the USDA currently prohibits the movement of cactus plants and cactus parts from Hawaii, Puerto Rico, and the Virgin Islands to the mainland. In addition, all plants, including cacti, imported into the country for propagation must be accompanied by a health certificate and be inspected at a USDA APHIS plant inspection station. All plant material found to be infested by the cactus moth is fumigated, destroyed, or returned to its country of origin. Further restrictions are in the process of being developed to protect the southwestern United States and Mexico from receiving cactus moth-infested nursery stock from the states that have the pest.

Citizens can help by monitoring prickly pear cacti in their areas for the

presence of distinctive bright orange-to-red caterpillars with black bands or spots on them. There are also native cactus-feeding caterpillars that are not as colorful and pose no threat. Please contact Dr. Barron Rector of the Texas A&M Extension Service (brector@tamu.edu), your land grant university, or state department of agriculture if you believe you have an infestation of the South American cactus moth, *Cactoblastis cactorum*.

For more information on the cactus moth and USDA's efforts to track and record cactus moth populations, please visit: http://www.aphis.usda.gov/ppq/ep/emerging_pests/cactoblastis/index.html

Also, Mississippi State University's GeoResources Institute is helping with the cactus moth detection effort by hosting a National Cactus Moth Detection and Monitoring Network website for land managers and others who wish to monitor prickly pear cactus in their area.

Visit the following website for more information: www.gri.msstate.edu/research/cmdmn/

