SDSU scientists 're-discover' switchgrass moth

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(PhysOrg.com) -- South Dakota State University scientists have “re-discovered” an insect that was first described by a scientist in the year 1910, but hasn’t been studied since.

And what they are learning about its diet and life cycle suggests it could be one of the first major pests of a new biobased economy that grows native grasses for energy.

SDSU professor Paul Johnson, a research entomologist, said SDSU

scientists found larvae of an unidentified insect that were responsible for losses on a private farm specializing in seed production of native grasses in 2006. At an SDSU research farm in 2007, professor Arvid Boe, a forage breeder, calculated that 40 percent or more of new tiller growth was lost to the caterpillar.

Then in 2008, Johnson collected adult moths using simple emergence traps, and estimated population densities of male moths using freshly emerged virgin females. He also collected larvae and reared them to adults on an artificial diet provided by colleagues at the University of Illinois.

Johnson, the curator of SDSU's Severin-McDaniel Insect Research Collection, said identifying the insect was a puzzle.

"At first we thought it was an undescribed species. I started calling it 'the switchgrass moth' because everything we know about it so far is that it feeds only on switchgrass," Johnson said. "We had no idea what this thing was. We had no identified material in the insect collection here that would allow us to identify it to any level. Suddenly this species, in an agronomic sense, was presenting itself as a pest of switchgrass."

SDSU's search for answers finally led scientists to Dr. David Adamski, a research associate with the Department of Entomology at the Smithsonian Institution in Washington, D.C. Adamski, a specialist in small moths, identified the insect and told them it had been reported to science in 1910.

"In this case a worker named Dietz using electric light collected two specimens of Blastobasis repartella from Denver, Colorado, and they weren't collected since," Adamski said.

Adamski made a trip to South Dakota in summer 2009 to gather

specimens of the insect. He's currently rearing adults of the moth from larvae that were collected in South Dakota in June and will co-author a paper about it with the help of colleagues including Johnson and Boe at SDSU, and another researcher from Illinois who has also found the insect in switchgrass plots.

"We're going to re-describe it and put it in modern terms," Adamski said.

The insect may not be rare so much as it has been simply ignored, Adamski said, since it apparently depends on a plant that previously was unimportant to humans.

"This moth is, with wings spread, very small and generally would go unnoticed by anyone. It's not like it's hiding," Adamski said. "An insect like this, someone would ignore it without a thought."

Johnson said the insect is an interesting example of issues that can emerge when a native plant is elevated to crop status.

"Part of the question from a biodiversity perspective is, how thoroughly do we know the insects of native prairie plants?" Johnson said. "As we convert native plants into crops, we are bringing with them the potential for new pests and diseases. Here we have a native, prairie grass-adapted species that apparently no one knew about."

Encouraging large tracts of native grasses as agricultural crops would give insects that use those species the signal to thrive. "When you start encouraging large monocultures, it's like there's a Thanksgiving feast laid out for them," Johnson said.

In fact, Johnson said, the switchgrass moth is only one of several puzzling insects that SDSU scientists have found in the course of their

research on various species of native grasses and other plants. One other switchgrass insect is a cecidomyid fly that was previously unknown to science.

“We now have a genus name, Chilophaga. And it is confirmed to be a new species,” Johnson said. “Then there are different moths, midges, aphids and other insects on big bluestem, prairie cordgrass, cup plant, and other plant species being studied as potential crops.”

Those ongoing discoveries among scientists who are working with native grasses that are being studied as potential feedstocks for cellulosic ethanol challenges an important assumption, Johnson noted.

“Before these recent discoveries, the mantra in the national biofuels and biomass circles was that there were no significant pests of concern and that growing native plants as crops would be environmentally benign if not beneficial. Our basic insect natural history work here at the Severin-McDaniel Insect Research Collection has shown this presumption to be false and that native prairie plants are just as vulnerable to insects as other crops,” Johnson said. “A major concern in the near future, then, becomes designing pest management programs.”

One of Johnson’s Web pages discusses both of those insects. Find it by going first to a Web page about SDSU insect research, nathist.sdstate.edu/smircol/index.htm . Click on “Biomass/Biofuels/Bioenergy Insects” near the bottom right of the page, then click on the link beside “Switchgrass.”

Adamski said the incident raises other serious biological issues for entomologists. The switchgrass moth belongs to a family called Blastobasidae, commonly known as scavenger moths. Yet repartella and other newly discovered relatives are not scavengers but phytophagous insects that feed on living plants. These new discoveries may change the

way scientists think about the group in general.

About 400 species of Blastobasidae are known worldwide, Adamski said, and of those only about six percent are known to have host plant associations. In addition, Adamski said, the number of known Blastobasidae is increasing. For example, Adamski has yet to publish a work on Costa Rican Blastobasidae that will add 102 new species to the list.

The incident points to the need for taxonomic expertise that focuses on insects that live inside the stems of plants, where the switchgrass moth lives for most of its life cycle.

The moth was discovered in plots that were established and evaluated when SDSU professor Arvid Boe's forage breeding research was supported by the South Dakota Agricultural Experiment Station; by the U.S. Department of Energy through a contract with the Great Plains Institute for Sustainable Development in Minneapolis; and by the Department of Energy's biomass program through a contract with Oak Ridge National Laboratory. More recently, his work has been supported by the North Central Sun Grant Center at SDSU.

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