Ant Study at Noxubee Refuge Suggests Healthy Ecosystem

By Patti Drapala

It is no secret that many ants live beneath the leaves, bark and soil of the Noxubee National Wildlife Refuge, but no one knew how diverse the population was until Mississippi State University entomologists dug up the facts.

Two researchers in the MSU Department of Entomology and Plant Pathology conducted a yearlong survey of ant species in different areas of the refuge. Their findings show that imported fire ants and other exotics have not displaced the natives. More importantly, the distribution and diversity of ants at the refuge indicate a well-managed, healthy ecosystem.

"The refuge was overgrazed and extensively farmed in the early 1900s," said Joe MacGown, ant curator for the Mississippi Entomological Museum at MSU. "It's amazing that this overworked area has made a comeback and can sustain such natural diversity."

Scientists estimate that ants make up 10 percent of the terrestrial animal biomass on the planet. Ants are important to ecosystems because they disperse seeds, help dispose of waste, kill large numbers of other insects, serve as food for many animals, and aerate soil and bring in needed nutrients. Their distribution and diversity often indicate an ecosystem's ability to maintain itself.

"Ants are good bio-indicators of what may be happening in an ecosystem because they are sensitive to disturbances that can occur," Hill said. "The refuge offered a variety of habitats that allowed us to investigate ant populations living under different situations."

The Noxubee refuge provided funding for the museum and the entomology department to conduct an ant survey. Refuge managers needed this information to have better tools for decision making.

The survey also allowed cooperators to carry out a U.S. Department of Agriculture mandate to document ant species and to monitor the spread of imported fire ants and other exotic ant species. MacGown and MSU entomology research associate JoVonn Hill designed the study to examine the composition of ant populations in land habitats, document potential new species and observe activities of exotics at the refuge.

"Our study will provide useful information for other ventures that are wider in scope, such as looking at the distribution of ant species in the Southeast and across the United States," said MacGown, who also works as a research technician and scientific illustrator for the MSU entomology department. "Ant specimens collected in Mississippi are routinely used in studies by other researchers around the world."

MacGown and Hill used baits, vegetation sweeps, litter samples and visual search techniques to collect specimens in the refuge. From September 2007 to October 2008, they surveyed six types of land habitats: pine forests; mixed pine-hardwood forests; bottomland hardwoods; upland hardwoods; open areas of grassland, roadsides and sand pits; and highly trafficked areas near buildings and picnic tables.

The survey accounted for 95 species of ants at the refuge. Of this total, eight were exotics and two were "undescribed," which meant they might be new species. Eight species also qualified as new state records, or species previously not known to occur in Mississippi.

"The rich diversity of ants that Joe and JoVonn found at the refuge is just one indication of how little we know about the insects in our state, and in this case, almost in our own backyard," said MSU entomologist Richard Brown, director of the museum. "Their documentation of the total number of ant species at the refuge, including new state records and new species, is a testament to their competency as researchers and field biologists."

Bottomland hardwoods had the highest diversity of ant species. More than 59 species live in that habitat.

"The bottomland hardwoods at the refuge experience periodic flooding, and we thought that ant populations might not be as plentiful," Hill said. "We found many different species that apparently have adapted to these conditions, and some of the species had escaped flooding by moving their nesting areas to treetops."

The study also showed that open fields supported the least diversity of ants. The two researchers found 19 species in these areas. They documented greater concentrations of exotic species in areas where people gather.

"We were surprised by the number of species we found at the refuge, which is a small area when you compare it with the Smoky Mountains, for example," MacGown said. "Only eight more species of ants are currently known to occur in the Great Smoky Mountains National Park than the number we discovered at the refuge."

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(Above) Joe MacGown, left, and JoVonn Hill peel bark to look for arboreal species of ants at the Noxubee Wildlife Refuge. The two surveyors uncovered a sizable population of diverse ant species coexisting at the refuge.

Researchers Joe MacGown, left, and JoVonn Hill dig around in the dirt as they survey for ant species at the Noxubee Wildlife Refuge.

Southeastern Ants

Offer Spin on Their Own Web

Joe MacGown

Spiders may have webs, but the ants of the Southeast have something that lasts a little longer than spun silk — their own Web page.

Joe MacGown, ant curator of the Mississippi Entomological Museum at Mississippi State University, built the page to make information easily available on different ant species found in southeastern states.

"There had been no common way to catalog information that was scattered across several platforms and in different locations," MacGown said. "Putting this information together in one place seemed like a logical idea."

The Web page, Ants (Formicidae) of the Southeastern United States, was funded through the Mississippi Agricultural and Forestry Experiment Station with the support of several state and federal agencies, private groups and individuals.

MacGown compiled information from scattered sources and his own observations. He created lists of species for each state and formatted identification keys, or sections, based on written descriptions in question-and-answer format. Included with this information are photographs, a glossary of scientific terms and a list of the museum's ant publications.

Selecting the correct couplet, or description, in the keys eventually leads to a species name. The name links to a page about that species with photographs and pertinent data.

"I used scientific names for each species, rather than common ones, because the scientific names are universally understood and used," MacGown said. "This greatly helps the researcher in searching for information and correctly identifying the species of ant they are looking for."

The site allows open dialog between researchers, which has resulted in collaborations with more than 100 researchers at 75 different institutions in 24 states and 12 countries.

The Web site also led to MacGown's involvement with other ant sites, such as Ant Web, a national site about ants. MacGown is curator for the site's Mississippi and Alabama pages.

"I started the Web site five years ago as part of my work designing a site for the museum," MacGown said. "This initially started when I began putting together information on ant species in Mississippi and Alabama, and then branched out to include species in the Southeast."

The popularity of the site has grown tremendously and it now averages 10,000 hits a day, MacGown said.

"We have some information gaps in the site because it is a work in progress and the taxonomy of ants is constantly changing," MacGown said. "A time goes by, we'll update the site and make it more complete."

Find the southeastern ant page online at the museum's Web site, http://mississippientomologicalmuseum.org.msstate.edu, and click on the photo of the ant