When Ants Go Sweating: Zoologists to Study Climate Change Effects

October 18 2007

A North Carolina State University zoologist is the lead researcher on a five-year, $3 million study that will turn up the heat on a number of ant species to learn more about the effects of climate change.

The study, says Dr. Rob Dunn, assistant professor of zoology at NC State, will specifically examine how climate change affects the movement and distribution of ants and other invertebrate species.

That's important, Dunn says, because, like a pebble that creates ripples in a pond, changes in insect distribution can have major effects on any number of aspects of ecosystems, including seed dispersal, pest control, where unwanted invasive insects may turn up next or where conservation efforts should be attempted – or abandoned.

Although there are in the order of 20,000 ant species, many of which have not been studied and therefore are unnamed, Dunn says enough work has been done to use ants as a good model to think about the rippling questions posed by climate change. Ants, says Dunn, are both economically and ecologically important in their own right and are also a kind of indicator of those multitudes of smaller species that constitute the majority of the diversity of life on earth.

In the study, funded by the U.S. Department of Energy, Dunn and colleagues from the University of Tennessee, University of Vermont and Harvard Forest will build "growth chambers" in Harvard Forest and at a site in North Carolina. The roofless chambers – 15 feet in diameter with

sides similar to those on a greenhouse – will expose ants and other insects to increasingly warm temperatures, culminating in the whopping five-degree Celsius boost expected in the year 2100.

"We want to see if changes in response to manipulations of temperature match changes we would predict using models. Do the ants, or any species, do what our models say they are supposed to?" Dunn says.

The researchers will place 10 growth chambers in Harvard Forest and 10 in North Carolina's Piedmont, areas Dunn called "the northern and southern edges of the ranges of lots of species, ant and otherwise" in eastern North America.

Fire ants are one species that live within this range. Dunn hypothesizes that, as the study progresses and temperatures increase in the growth chambers, fire ant abundance should increase in the North Carolina sites, with negative effects for native ants and the processes they carry out. Even minor temperature changes may make sites further north more and more inviting for fire ants.

"Millions of dollars are spent on fire ant deterrents," Dunn says. "Fire ants compete with ants that perform what we would consider to be good and helpful functions. Will climate effects on fire ants be so great under future scenarios that it's not useful to worry about native species, or will fire ants and other invasives be far worse than they are now?"

The corollary effects on native ant distribution may be even more unsettling than the promise of an invasion of fire ants. For example, Dunn says, ants play crucial roles in dispersing seeds of important plants like violets and bloodroot. Take the specific ants that disperse seeds away, Dunn says, and those plants might become less prevalent, too.

Or take the case of the red-cockaded woodpecker. The bird feasts

exclusively on a certain species of ant during the winter. If those ants move or become extinct, what happens to the woodpecker?

"We don't have a handle on the magnitude of climate change or its effects," Dunn says. "We hope that studying ants will help us understand more about answers to these types of questions. We can't manipulate the temperature entire populations of birds or bears are exposed to, but we can do it for ants and the other smaller species. And in the end, most species on earth are insects, so ants may be far more representative of the general response to climate change than are the – relatively speaking – enormous species like rats and birds."

Source: NC State