Urbanization, Higher Temperatures Can Influence Butterf Emergence Patterns

For Immediate Release

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An international team of researchers has found that a subset of common butterfly species are emerging later than usual in urban areas located in warmer regions, raising questions about how t insects respond to significant increases in temperature.

“We know that butterflies emerge earlier in North Carolina than they do in New England, because it’s warmer,” says Tyson Wepprich, a Ph.D. student at NC State and co-author of a paper describing the work. “We also know that cities are heat sinks that are warmer than outlying areas. So we wanted to see whether butterflies would emerge earlier in cities than they do in more rural environments.”

An Eastern Tiger Swallowtail, of the affected species. Phot credit: Rob Liptak. Click to enlarge.

To address the question, the research team focused on 20 of the most common butterfly species found in Ohio. The team used data from the Ohio Lepidopterists’ Society, whose volunteers monitor butterfly populations at sites across Ohio every week from April through October. The work was done by researchers at North Carolina State University, Case Western Reserve University, the Instituto de Pesquisas Ecológicas in Brazil, and the University of Maryland.

The researchers used the Ohio monitoring data from the years 1996 to 2011 to establish when ea species emerged at each site every year, when each species’ population numbers peaked at ea site every year, and the last recorded observation of each species at each site every year. The researchers also looked at the temperature and urban density around each monitoring site.

There was a wide range of responses to urbanization across species, but one finding stood out.

“The combined effect of an urban area and a warmer part of the state appeared to delay emerg in seven of the 20 species,” Wepprich says.

The affected species in these areas, including the Eastern Tiger Swallowtail, emerged days or we after other butterflies of the same species emerged in either rural areas in the warmer parts of Ol

or urban areas in colder parts of Ohio.

“Even though butterflies often change their emergence predictably to small increases in tempera these species responded in unexpected ways to larger increases in temperature,” Wepprich says

“Scientists often use analogies for global climate change, such as urban warming, to understand species’ might respond to a warmer future,” Wepprich adds. “This allows us to estimate which species are more vulnerable to climate change.

“We don’t really know precisely where the tipping point is, or why only some species respond t way, but something is happening here. We’re still working to better understand what’s going o with these butterfly species and what consequences there may be for their populations.”

The paper, “Unexpected phenological responses of butterflies to the interaction of urbanization a geographic temperature,” is published online in the journal *Ecology*. Lead author of the paper is Sarah Diamond, an assistant professor at Case Western and former postdoctoral researcher at NC State. Co-authors include Heather Cayton, Rob Dunn and Nick Haddad of NC State; Clinton Jenki the Instituto de Pesquisas Ecológicas; and Leslie Ries at the University of Maryland.

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Note to Editors: The study abstract follows.

“Unexpected phenological responses of butterflies to the interaction of urbanization and geographic temperature”

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Abstract: Urbanization and global climate change can profoundly alter biological systems, yet scientists often analyze their effects separately. We test how the timing of life cycle events (phenology) is jointly influenced by these two components of global change. To do so, we use a l term phenological dataset of 20 common butterfly species from 83 sites across the state of Ohio, USA, with sites that range from rural undeveloped areas to moderately sized cities. These sites s a several °C latitudinal gradient in mean temperature, mimicking the range of projected global cli warming effects through the end of the century. Although shifts toward earlier phenology are typ of species’ responses to either global climate change or urbanization, we found that their intera delayed several Ohio butterfly species’ first appearance and peak abundance phenology. Exploit