

Urbanization, higher temperatures can influence butterfly emergence patterns

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Eastern Tiger Swallowtails are one of seven common butterfly species in Ohio that emerged days or weeks after other butterflies in warmer urban areas. Credit: Rob Liptak

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 the 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."

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 each species emerged at each site every year, when each species' population numbers peaked at each 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 emergence in seven of the 20 species," Wepprich says.

The affected species in these areas, including the Eastern Tiger Swallowtail, emerged days or weeks after other butterflies of the same species emerged in either rural areas in the warmer parts of Ohio, or [urban areas](#) in colder parts of Ohio.

"Even though butterflies often change their emergence predictably to small increases in temperature, 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 how 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 this way, but something is happening here. We're still working to better understand what's going on with these butterfly species and what consequences there may be for their populations."

More information: The paper, "Unexpected phenological responses of butterflies to the interaction of urbanization and geographic temperature," is published online in the journal *Ecology*.
www.esajournals.org/doi/abs/10.1890/13-1848.1

Provided by North Carolina State University

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