

Study shows color of dragonflies changes throughout the year

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Different coloured dragonfly species (from left to right): The Small Whiteface (*Leucorrhinia dubia*) is a dark species that flies mainly in spring and early summer. The Keeled Skimmer (*Orthetrum coerulescens*), a light-coloured species that flies mainly in midsummer. The Black Darter (*Sympetrum danae*), a dark species that flies mainly in late summer and fall. Credit: Christian Hof / Uni Würzburg

The color of dragonfly communities reacts to seasonal variation in solar radiation. Over the last 30 years, however, this color pattern has changed—probably as a result of climate change.

In a new study, researchers at Julius-Maximilians-Universität Würzburg (JMU) in Bavaria, Germany, have discovered that the color of dragonfly communities reacts to seasonal fluctuations in solar radiation. In spring and autumn, dragonflies with darker color nuances are more likely to fly, while the specimens that appear in summer tend to be lighter in color. The results of the study have now been [published](#) in the journal *Nature Communications*.

The color adaptation allows the predatory insects to regulate their body temperature. Dark colors absorb heat better than light colors. It is important to note that it is not individual animals that change their color, explains Professor Christian Hof. He heads the newly created Chair of Global Change Ecology at JMU. "What changes and adapts to solar radiation, so to speak, is the average coloration of all dragonflies flying at any one time."

Previous research showed that in [northern regions](#), darker-colored and larger dragonfly species tend to fly, as they are better able to retain heat. Lighter-colored species, on the other hand, are found in the sunny south, where their coloration protects the animals from overheating.

Color change over the course of the year verified for the first time

The team led by Dr. Roberto Novella Fernandez and Professor Christian Hof began their work during their time at the Chair of Terrestrial Ecology at the Technische Universität München (TUM) and completed it after moving to JMU together.

For the study, they examined and analyzed scientific observation data of dragonfly communities from 1990 to 2020 in the U.K. The researchers discovered that the average coloration of dragonflies changes seasonally.

"For the first time, we were able to prove that the average body brightness of dragonflies not only differs between warmer and colder regions, but also that lighter species tend to be found during the course of the year in months with stronger sunlight, i.e., in summer, while darker specimens fly in spring and autumn," explains Roberto Novella Fernandez, lead author of the study.

Christian Hof adds, "We also see in the evaluated data that this seasonal color variation has changed in the course of climate change." However, [global warming](#) is primarily changing the temperature and not the solar radiation.

"The warming may even be shifting the pattern in a direction that is unfavorable for the dragonflies because they no longer fly under ideal [solar radiation](#) conditions. Understanding this in more detail is one of our next goals," continues Novella.

In the current study, the researchers, in collaboration with colleagues from the Philipps-Universität Marburg, were able to evaluate the available data on the color characteristics of dragonflies. "By relating changes in the characteristics of species, such as the coloration of insects, to [environmental changes](#), we can better understand the causes of biodiversity loss. The aim of our research group at TUM ... was to contribute to this. We want to continue this work at the University of Würzburg," concludes Christian Hof.

More information: Roberto Novella-Fernandez et al, Seasonal variation in dragonfly assemblage colouration suggests a link between thermal melanism and phenology, *Nature Communications* (2023). [DOI: 10.1038/s41467-023-44106-0](https://doi.org/10.1038/s41467-023-44106-0)

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