The buzz on how climate change impacts nature's mimicry system

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Credit: Marcin Jozwiak from Pexels

EU researchers are studying how a changing climate affects hoverflies, which mimic bees and wasps, and the evolutionary consequences of these changes.

In some form or fashion, all animals and plants interact with other animals and plants. For example, sometimes they eat or are eaten by other organisms. Other times they compete with one another over access to food and water, such as when birds scrabble over a bird feeder. And sometimes animals or plants work together for everyone's mutual benefit, like the fungi and algae found in lichens.

Of course none of these associations happen overnight, but are the result of a long history of co-existence, during which a degree of balance is struck that allows animals and plants to cooperate in a stable manner. However, these historic couplings are under immediate threat, the result of the rapid, human-induced climate change that has the potential to 'decouple' these interacting species.

Introducing the hoverfly

As the threat of decoupling is a new phenomenon, little is known about its effects on species and what its potential long-term consequences are. The EU-funded ECOEVOMIMIC project is working to fill this knowledge gap by being the first to study the impact that climate change has on a mimicry system. For this particular study, the mimics of choice are hoverflies, a group of species that mimic stinging bees and wasps. Like the bees and wasps they mimic, hoverflies are economically important pollinators that are seeing their overall population decrease.

'I'm interested in the evolutionary consequences of changes in the timing of animal activity', says project researcher Dr Christopher Hassall. 'More specifically, the project has aimed to determine the ecological responses to climate change in these animals, and the evolutionary consequences of these responses, as well as provide novel experimental tests for hypotheses that explain the evolution of mimicry across a range of other animal groups.'

Field experiments and human psychology

In the first phase of the project, Dr Hassall and his team successfully demonstrated that hoverflies are actively advancing their phenology in response to climate change. Based on this finding, the project is exploring what the consequences are for these animals and their relationship to other species. 'Hoverflies, which are harmless and do not sting, imitate the appearance, behaviour and sounds of bees and wasps in order to deter a predator', explains Dr Hassall. 'This mimicry, however, relies on predators being able to learn to avoid wasps and bees and then avoid the hoverflies that resemble these stinging insects.'

Thus, the second phase of the project is focused on exploring how changes in the timing of hoverfly activity relative to bees and wasps might interfere with predators' ability to learn. To accomplish this, the project uses a combination of field experiments and ongoing human psychological experiments as a method for exploring how predators perceive shifting patterns of occurrence.

The experimental design used by the ECOEVOMIMIC project is based around a continuum of experimental control. Although the field experiments had very little control and were subject to a large number of uncertainties, they also provided the most relevant insights into biological questions. Working with human participants as 'predators' in computer games, on the other hand, offers a great deal more control, but clearly humans are not hoverfly predators. However, it is assumed that the general cognitive machinery employed by humans is sufficiently similar to that of birds as to be useful in making biological inferences.

Diversity and distribution

The significance of the ECOEVOMIMIC project is that it examines the

consequences of climate change for a neglected but important group of insects. 'These animals are important pollinators and many also help control such pests as aphids', says Dr Hassall. 'As a result, these findings contribute to both an understanding of how ecosystems will be affected by the changing climate and to our knowledge about the diversity and distribution of an important pollinator group.'

More information: Project website: ecoevomimic.christopherhassall.com/

Provided by CORDIS

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