

# Butterflies could lose spots as climate warms

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A female with three spots on the hindwing. Credit: Professor Richard ffrench-Constant

Female meadow brown butterflies have fewer spots if they develop in warmer weather—so climate change could make them less spotty, new

research shows. The work is published in *Ecology and Evolution*.

University of Exeter scientists found females that developed at 11° C had six [spots](#) on average, while those developing 15° C had just three.

The findings challenge long-held scientific views about why these butterflies have varying numbers of spots.

"Meadow Browns always have large 'eyesspots' on their forewings, probably for startling predators," said Professor Richard ffrench-Constant, from the Centre for Ecology and Conservation on Exeter's Penryn Campus in Cornwall. "They also have smaller spots on their hindwings, probably useful for camouflage when the butterfly is at rest.

"Our findings show that fewer of these hindwing spots appear when females experience higher temperatures during their pupal stage (in a chrysalis before emerging as a butterfly). This suggests the butterflies adapt their camouflage based on the conditions. For example, with fewer spots they may be harder to spot on dry, brown grass that would be more common in hot weather. We did not observe such a strong effect in males, possibly because their spots are important for [sexual selection](#) (attracting females)."



A female Meadow Brown with one spot on its hindwing. Credit: Professor Richard ffrench-Constant



Spotless hindwings may help with camouflage in hot and dry conditions. The forewing eyespot can be hidden by the hindwings. Credit: Professor Richard French-Constant

Since the classic work of biologist EB Ford, eyespot variation in the meadow brown butterfly has been used as an example of "genetic polymorphism" (the co-existence of multiple genetic forms in a single population). However, the new study shows the eyespot variation is caused by thermal plasticity (the ability to react to changing temperatures).

"This is a family story for me, as my father collected [butterflies](#) for EB

Ford here in Cornwall," Professor ffrench-Constant said. "In the new study, we looked at current Cornish populations—collecting males and females from the same field every day throughout the flight season—and historical collections from Eton and Buckingham."

The researchers predict that spotting will decrease year on year as our climate warms.

Professor ffrench-Constant added, "This is an unexpected consequence of [climate change](#). We tend to think about species moving north, rather than changing appearance."

Meadow browns spend about 28 days in the pupal stage, usually emerging in late spring in the UK.

**More information:** Eyespot variation and field temperature in the Meadow Brown butterfly, *Ecology and Evolution* (2024). [DOI: 10.1002/ece3.10842](#)

Provided by University of Exeter

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