# Butterfly vision, wing colors linked: Ability to identify own species aided by ultraviolet pigment

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Heliconius erato butterflies have evolved photoreceptors in their eyes for detecting UV colors and express UV-yellow pigment on their wings. Photo by Image courtesy of Bill Berthet

(PhysOrg.com) -- Butterfly experts have suspected for more than 150 years that vision plays a key role in explaining wing color diversity. Now, for the first time, research led by UC Irvine biologists proves this theory true - at least in nine *Heliconius* species.

Butterflies that have a duplicate gene allowing them to see ultraviolet colors also have UV-yellow pigment on their wings, reports the study by UCI's Adriana Briscoe, Seth Bybee and colleagues. The UV-yellow pigment may help the butterflies survive by facilitating the search for

appropriate mates, which leaves more time for reproducing, eating and thriving.

"They're not wasting their time chasing after the wrong mate," said Briscoe, associate professor of ecology & evolutionary biology and lead author of the study, published online recently in the *Proceedings of the National Academy of Sciences*.

Butterflies developed a copy of their UV-vision gene and began displaying UV-yellow pigment 12 million to 25 million years ago, the scientists believe. Of the 14,000 butterfly species in the world, only the *Heliconius* living in the forests of Mexico and Central and South America are known to have the duplicate gene.

After researchers discovered the copied gene, "we wanted to find out why it might be advantageous," Briscoe said. They examined thousands of wing-color patches and found that butterflies with just one UV-vision gene had yellow wing pigment that was not UV. However, the pigment was UV in butterflies with both genes.

Early naturalists hypothesized that wing-color mimicry - causing butterflies to resemble bad-tasting relatives - emerged as a defense mechanism to confuse predators such as birds. This created a problem, though: Butterflies that evolved to look alike had a hard time identifying the right species with which to mate.

Having both genes allows molecules to form in the eyes that are more sensitive to UV light. "We think that by switching to a new way of making yellow, the mimetic butterfly species were better able to tell each other apart," Briscoe said.

The diverse wing patterns of *Heliconius* butterflies have generated much scientific interest in recent years, including a genome-sequencing project

co-directed by UCI's Robert Reed, assistant professor of ecology & evolutionary biology.

Said Briscoe: "We now have strong reason to believe that we'll find other examples in which vision and wing colors are linked."

Provided by University of California - Irvine