MSU geneticist helps find butterfly gene, clue to age-old question

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Brian Counterman, an evolutionary geneticist in Mississippi State University's department of biological sciences, views butterfly specimens in his research laboratory on campus. Counterman and other researchers have found a key gene related to survival of Heliconius butterflies.

(PhysOrg.com) -- Years after sleeping in hammocks in the wilds of Peru and Panama, collecting hundreds of thousands of samples of colorful insects, Mississippi State assistant professor Brian Counterman now is helping unlock a very difficult puzzle.

The more-than-century-long challenge has involved a secret of the

Heliconius butterfly, the orange, black, yellow, and red insect that hasn't easily communicated how all its radiant colors came to be.

For evolutionary biologists, and especially geneticists like Counterman, the butterflies--commonly called passion vine butterflies--make perfect research subjects for better understanding the important scientific question: How do organisms change to survive?

Over the past decade, the researcher in the university's biological sciences department has been part of an international team using field experiments, genetic mapping, population genetics, and phylogenetics to study the butterflies' biology and history.

A Duke University doctoral graduate in biology and evolutionary genetics, Counterman studied genetics of adaptation as part of his post-doctoral research at North Carolina State University. He joined the MSU faculty in 2009.

Passion vine butterflies are found throughout South and Central America. Through the years, scientists observed that Heliconius butterflies with certain red patterns survived in certain areas, while others didn't.

"There are very few cases that we know what traits determine if an organism will survive in nature," Counterman said, adding that he and a team of researchers recently uncovered the gene responsible for the different red wing patterns.

Their finds were featured in the July issue of *Science* magazine.

Counterman said the butterflies use red as a warning signal to birds and other predators that they are poisonous and should not be consumed.

"This is one of the first examples where we've found the genetic change that allowed (an organism) to live or die in nature," he observed, adding that finding the red gene was just the first step in understanding how they have survived.

Counterman and his team further analyzed the red gene to reconstruct when the different red patterns evolved, providing important clues into how rapidly new adaptations can arise and spread in populations that nearly encompass entire continents.

This research was showcased on the cover in a December issue of the *Proceedings of the National Academy of Sciences* of the United States.

For scientists like Counterman, finding answers to these questions may give insight about how and why the diversity in the world evolved. And, there is still more to come.

Counterman now is part of a team sequencing the entire Heliconius genome--one of the first butterfly genomes--that should open the door to a new level of questioning into the biological causes for one of the most charismatic groups of organisms on earth.

While these studies involve one of nature's most delicate and enchanting creatures, they are part of a larger, serious inquiry that most humans consider at some point in their lives:

"How did the world get to where it is?" Counterman said recently, discussing his fascination with genetics and biology.

Provided by Mississippi State University

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