

Caribbean Lizards Settle 'Founder Effect' Controversy



This is a founder pair of Caribbean brown anole lizards, one of the actual colonist couples, shortly after release. They were involved in the first experimental study of the founder effect -- a long-simmering controversy in evolutionary biology -- in a natural setting. The study by UC Davis researchers and others is published in the Feb. 3 edition of the journal Science Express, the online publication of the journal Science. (Credit: Manuel Leal/Duke University)

Feb. 2, 2012 — When a devastating 2004 hurricane wiped out a Caribbean lizard population, University of California, Davis, researchers had an unprecedented opportunity to address a long-simmering controversy in evolutionary biology. Their findings -- from the first experimental study of the so-called "founder effect" in a natural setting -- are published in the Feb. 3 edition of *Science Express*, the online publication of the journal *Science*, which will publish the study in print on Feb. 17.

The founder effect describes the loss of genetic variation that occurs when a new population is established by a very small number of individuals from a larger population. But the extent to which this effect contributes to evolution has been up for debate since the early 1940s, when German evolutionary biologist Ernst Mayr first outlined it.

Some scientists argue that the founder effect is pivotally important in how a species evolves. Others argue that it is a bit player on the evolutionary stage, quickly overwhelmed by the forces of natural selection.

In their new paper, UC Davis scientists, together with researchers from Harvard and Duke, suggest that both sides are right.

Complicating the debate has been the dearth of data from nature: Founder events are rarely observed.

"Founder effects are very hard to study," said Thomas Schoener, a professor of evolution and ecology at UC Davis and a co-author of the study. "One must be in exactly the right place at the right time to observe the founder event -- and then fortunate enough to be able to follow a population through time."

That opportunity presented itself in September 2004, when Hurricane Frances submerged several small, low-lying islands near Great Abaco, Bahamas.

Before the hurricane, these islands supported populations of a Caribbean lizard, the brown anole, *Anolis sagrei*. After the hurricane, seven of the islands were thoroughly searched. No lizards were found.

In May 2005, the researchers randomly selected one male and one female brown anole from lizards collected on a nearby larger island to found new anole populations on seven small islands.

During the next four years, the researchers repeatedly sampled lizards from the source island, from the seven experimental founder islands, and from 12 nearby islands that served as a control.

The team found that all lizard populations adapted to their environment, yet retained characteristics from their founders.

For instance, lizard limb length correlates with the average diameter of vegetation on an island. Because the founder islands had smaller vegetation than the source island, the length of lizard limbs decreased, as expected, due to natural selection.

But islands containing lizards with the largest limbs at the beginning of the study still had the lizards with the longest limbs at the end of the study.

"Natural selection drives them all down, while the founder effect keeps the order the same," said Schoener. "So they're both right, in a sense."

If natural selection had overpowered the founder effect, lizards' limbs would have converged at the same length, regardless of how long-legged the founders were. Instead, limb length decreased roughly in parallel, signifying the persistence of the founder effect.

"Our study is an entirely unique approach to a question of longstanding importance for evolutionary biology regarding the founder effect: Will it persist in the face of the strong selection that would often exist in the colonized environment?" said Schoener. "The answer we found is that founder effects can leave a persistent signal as generations replace one another over time, even as populations adapt to new conditions. Our study of these fundamental evolutionary principles affects our general understanding of how the biological world works."

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Journal Reference:

1. J. J. Kolbe, M. Leal, T. W. Schoener, D. A. Spiller, J. B. Losos. **Founder Effects Persist Despite Adaptive Differentiation: A Field Experiment with Lizards**. *Science*, 2012; DOI: [10.1126/science.1209566](https://doi.org/10.1126/science.1209566)

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