USU ecologists propose new method to probe population growth questions

July 15 2016, by Mary-Ann Muffoletto

Moose and her calf in Colorado's Rocky Mountain National Park. Utah State University ecologists and colleagues report development of a new series of mathematical equations aimed at explaining why some organisms adapt and flourish, while others decline. Credit: U.S. Department of the Interior.

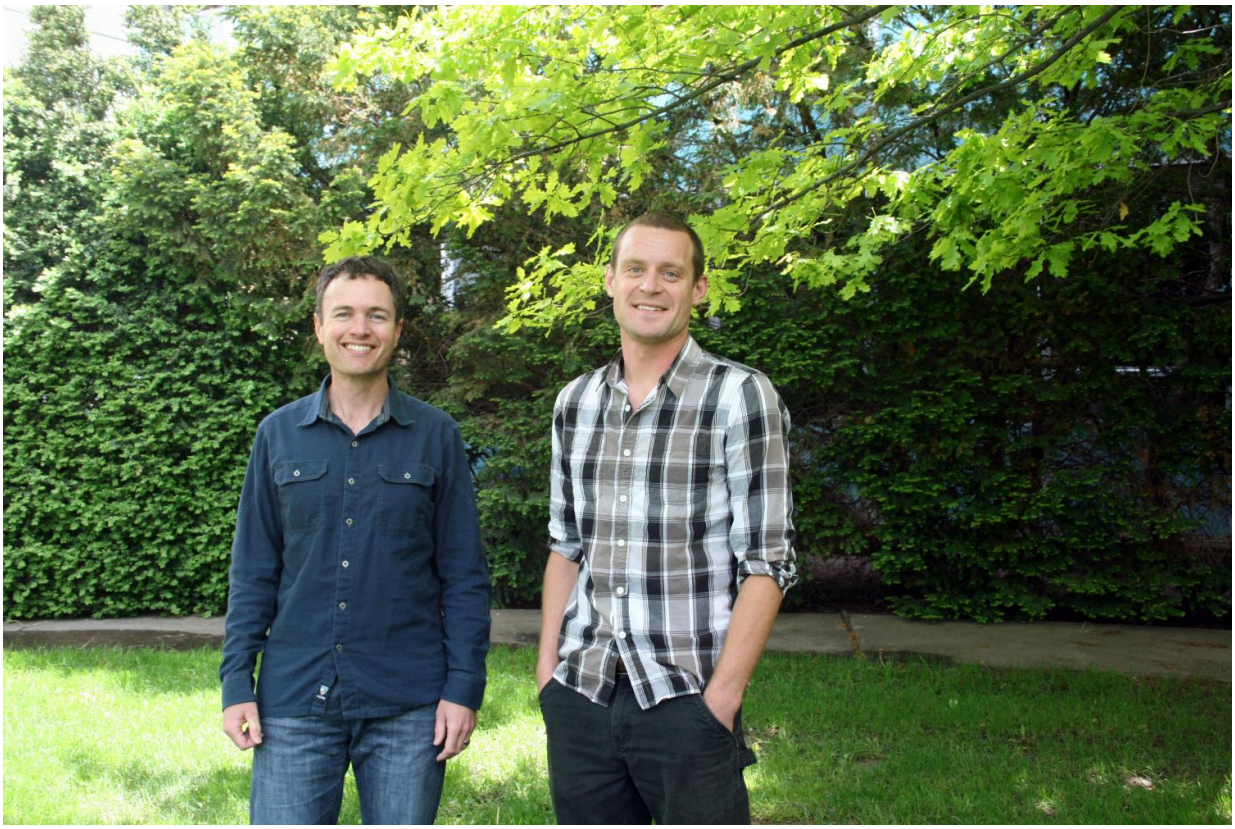
By developing an innovative series of mathematical equations, Utah

State University ecologists are shedding light on a stalemate that's vexed population biologists' understanding of why some organisms adapt and flourish, while others decline.

"The diversity of life on Earth captivates us," says David Koons, associate professor in USU's Department of Wildland Resources and the USU Ecology Center. "Just as species have evolved an array of interesting physical and behavioral characteristics, so have they evolved a diversity of life histories, including patterns of birth, growth, reproduction and survival rates, to multiply."

With USU colleague David Iles, Michael Schaub of the Swiss Ornithological Institute and Hal Caswell of The Netherlands' University of Amsterdam, Koons devised a way to distill "contributions" from each part of a species' life cycle to illuminate which parts; that is, rate of sexual development, fecundity, survival probabilities, that drive population growth and evolutionary fitness. The scientists discuss their research in the July 11, 2016, online issue of *Ecology Letters.*

"A major aim of ecology and evolution is striving to understand which parts of the life cycle drive population growth," Koons says. "But current understanding of how each part contributes is largely based on limiting assumptions of either constant environments or environmental variation around a constant average."



Utah State University ecologists David Koons, left, and David Iles, along with colleagues Michael Schaub of the Swiss Ornithological Institute and Hal Caswell of the University of Amsterdam, describe a new approach for determining how varied life cycle 'contributions' drive population growth and evolutionary fitness in the July 11, 2016, issue of *Ecology Letters*.. Credit: Mary-Ann Muffoletto/USU.

These conditions, he says, do not aptly describe our current world, where "average conditions" are shifting because of climate change and human alterations to land and waterways.

"Despite being one of the most mature disciplines in biology, population biology has reached an impasse in trying to close the gap between methodological assumptions and observed reality," Koons says.

"Paraphrasing Mark Twain, this means a great deal of 'what we think we know just ain't so.'"

The team's efforts don't provide pat conclusions to pressing questions, he cautions, but offer a new approach that can be applied to existing data to help provide more robust answers to a wide range of demographic questions in ecology and evolution.

Provided by Utah State University