

Climate change causes larger, more plentiful marmots, study shows

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This is a yearling yellow-bellied marmot Credit: Arpat Ozgul

This week, one of the world's foremost scientific journals will publish results of a decades-long research project founded at the University of Kansas showing that mountain rodents called marmots are growing larger, healthier and more plentiful in response to climate change.

The groundbreaking study, published in *Nature*, is the first to reveal that changes in seasonal timing can increase body weight and [population size](#) simultaneously in a species — findings likely to have implications for a host of other creatures, especially those that hibernate.

Established by Kenneth Armitage, KU professor emeritus of ecology and [evolutionary biology](#), the long-standing investigation tracks yellow-bellied marmots in Colorado.

"We started this research in 1962, and every summer we'd record basic [demography](#) such as the age of the animals, gender, [body mass](#), who survived and who reproduced," Armitage said. "At the time we started, we had no idea that climate change was going to be a problem. But we collected that basic demography to use as a foundation for other kinds of study."

Largely because of the KU researcher, yellow-bellied marmots have proven to be a valuable [model organism](#) for understanding larger questions. Armitage said that he first chose to study the marmot because it lives in easy-to-find burrows and is active in the daytime, so it is readily observable.

"I didn't intend to spend 40 years studying marmots, but new questions kept coming up — physiological, hibernation, genetics and so on," Armitage said. "It turned out that long-term studies of our kind are quite rare. Yet, it's precisely the kind of data that you need to determine what climate change is going to do."

The [climate-change](#) findings result from collaboration between a number of international researchers who used fieldwork by Armitage to underpin their analyses. Both Arpat Ozgul, lead author of the study from Imperial College London, and Dan Blumstein, a co-author from the University of California-Los Angeles, previously have worked with Armitage on the marmot project.

Using data collected between 1976 and 2008, the authors conclude that a longer growing season has boosted marmots' individual size, overall strength and general population. The average weight of fully grown marmots jumped from 6.82 pounds in the early years of the study to 7.56 pounds in the later half of the study.

Additionally, the population growth of marmots increased from 0.56

marmots per year from 1976 to 2001 to 14.2 marmots per year from 2001 to 2008.

"The warming results in earlier snowmelt, which means that plants appear sooner and the marmots come out of hibernation earlier," said Armitage. "They have more fat left which provides them energy to start foraging. Then they can start reproducing so their young are born earlier and have time to get fat enough to survive hibernation. Most importantly, the reproductive female can survive better. Being able to wean her young earlier, she has a longer season and survival of adult females has increased over the last years."

Although Armitage is happy to see the yellow-bellied marmot thrive, the KU researcher cautioned that the boom in marmots is temporary; he expects that warming could harm them in the long run because of changes in snow patterns.

"This benefit to marmots is probably short-lived," he said. "Snow patterns both benefit and harm marmots. Prolonged snow cover in the spring increases mortality and reduces reproduction. But if there's less snowmelt to nourish plants that marmots forage in the summer, it will severely affect them. In droughts, we've had very high mortality."

More information: "Coupled dynamics of body mass and population growth in response to environmental change" *Nature*, 21 July 2010

Provided by University of Kansas

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