Colorado Cottontails May Hybridize in Response to Changing Habitats

Take a stroll through the suburbs of Denver, and you'll more than likely run into a rabbit hanging out in someone's backyard or hopping through the manicured shrubs of a neighborhood. The abundant rabbits you see are known as cottontails, recognizable by their signature white puffy tail and upright ears. What you probably haven't noticed, however, is that there are actually three different species of cottontail, all living together in the capital of Colorado, and they might be mating, even though they shouldn't.

New research from the University of Denver suggests that a process called hybridization is occurring among Colorado cottontails, and it may be the fault of humans. Hybridization is the concept of interspecies mating, where two individuals who normally wouldn't, or shouldn't, mate, reproduce and have offspring that grow into viable adults. Hybridization is more common than expected, and happens between many other mammals, like chipmunks, mice, and even humans. Our early ancestors most famously hybridized with Neanderthals, a hominid species that went extinct around 40,000 years ago. But evidence of hybridization among Colorado cottontails would be a novel discovery within the *Sylvilagus* genus.

Three species, the desert cottontail, the mountain cottontail, and the eastern cottontail, didn't always coexist together in Colorado. Desert cottontails happily roamed the lower elevations of Colorado's plains, while mountain cottontails stuck to the higher elevations of the Rocky Mountains. Eastern cottontails, as the name suggests, originated in the eastern range of the United States.

But, as humans spread across the United States, cutting down trees, building homes, and fertilizing grass, the rabbits followed. Their habitats began to overlap, changing elevations and moving into urban landscapes. Grassy backyards and groomed bushes make the perfect home for cottontail rabbits.

Initial data collected by researcher Uma Knaven shows these rabbits may not hesitate to mate with the wrong species when given the opportunity. By sequencing the mitochondrial DNA of several cottontail individuals across the three species, she was able to glimpse into the ancestry of these rabbits.

Mitochondrial DNA, a set of DNA separate from that found in the nucleus of a cell, can be very useful when determining what species a rabbit's parents were. Mitochondrial DNA is found in the mitochondria, the organelles within your cells responsible for creating energy. They use their own set of DNA to build proteins and run their functions. This type of DNA is still just as unique as a fingerprint, but it has the advantage of being strictly inherited from the mother, rather than the mother and father.

Knaven sequenced 28 individuals who already had their species identified using physical traits. She then used the advantages of mitochondrial sequencing, being able to determine the species of the rabbit's mother through its genetics, to identify if any of the cottontail individuals were morphologically identified as a different species than its mother. Essentially, did the genome match with what the rabbit looked like?

In most cases, Knaven says, the answer was yes.

"Most cottontails we sequenced both looked and sequenced as the same species. However, in a few individuals, this was not the case," she says.

In two of the rabbits, who appeared to be eastern cottontails, their genetic sequencing indicated otherwise, labeling them as desert cottontails. One other individual appeared to be a mountain cottontail but sequenced as an eastern. These three individuals are the first sign that hybridization has occurred, where the mother of the rabbit was not the same species as the father.

Knaven admits this is not enough evidence to make any conclusive claims. “A bigger sample size is definitely necessary to claim hybridization is occurring among Colorado cottontails. Flukes happen. With only three individuals out of 28, it’s difficult to make any real claims. But this is a start, a spark to continue the research we need to understand and protect these animals.”

While the act of hybridizing is not necessarily bad news in and of itself, it may have big consequences on how we view the environment and provide new insight into the true scope of human impact on the Earth. If Colorado cottontails can hybridize with assistance from humans, what other species may be affected by man-made problems, like climate change and habitat destruction? While other species are known to hybridize, like lemurs, mice, and chipmunks, the evidence supporting human mediated hybridization is limited by the novelty of its study.

Hybridization is also an important factor to consider with the process of evolution and speciation, or the creation of new species.

“Moving forward, I think we’ve opened the door to ask bigger and broader questions about the world around us,” says Knaven. “This kind of research makes me excited, and I hope it makes others excited too.”