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By: John Davis • Texas Tech University.

In the summer of 2010, the Rolling Plains of West Texas expected a bumper crop of quail. By October, they nearly had vanished.

Now, as part of the largest quail disease study ever undertaken in the U.S., scientists at The Institute of Environmental and Human Health at Texas Tech University believe they have found a major culprit. Researchers in the Wildlife Toxicology Laboratory necropsied hundreds of birds throughout a 19-million-acre area of land and discovered large

numbers of parasitic eyeworms in many of the birds they sampled.

The study, part of multi-million-dollar Operation Idiopathic Decline and funded by the private Rolling Plains Quail Research Foundation, is titled "Evidence of an *Oxyspirura petrowi* Epizootic in Northern Bobwhites (*Colinus virginianus*) Texas, USA." It was published in the *Journal of Wildlife Diseases* and provides evidence of how the parasitic outbreak began.

"When we first got into this research project and started peeling back the layers of this onion, we asked if it's possible for a parasite to move that quickly through a population on a large area," said Ron Kendall, professor of environmental toxicology at Texas Tech and lead investigator. "And we answered the question. It's 'yes.'"

Other researchers include a key collaborator, Alan Fedynich, an associate professor and research scientist at Texas A&M University-Kingsville, a post-doctoral research associate and three doctoral students in the Wildlife Toxicology Laboratory.

Rick Snipes, president of The Rolling Plains Quail Research Foundation, said he was impressed with the researchers' findings.

"As a result of the massive die-off in 2010, our board of directors made a decision to fund the first disease and parasite study done in the United States in more than 80 years," Snipes said. "To date, we have invested \$4.3 million in Operation Idiopathic Decline, which includes Dr. Kendall's work. We are thrilled beyond imagination at the results that he and his research team have discovered, and we plan on supporting it until its completion."

Throughout the Rolling plains, Kendall and others found a significant infection rate with the birds they



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trapped. Kendall said the eyeworm can range in size from about an eighth of an inch to the diameter of a penny. Once inside the birds, they move freely from eye to eye through the sinus cavity, where they suck the blood of the birds, mate and release eggs.

In the paper "Live Eyeworm (*Oxyspirura petrowi*) extraction, in-vitro culture, and Transfer for Experimental Studies" published in the Journal of Parasitology, Kendall describes how these parasitic nematodes ingest blood from the quail and feed predominantly in ducts behind the eye, where they can cause severe inflammation and edema from their feeding activities.

"We did a size comparison," Kendall said "If these parasites were in a human and you compared the size of the quail eye to the human eye, it would be like having a worm about the size of a toothpick behind your eye. Now, imagine having up to 40 or 50 of them in there, and we have seen this in the wild. That could certainly impair your ability to see and cause serious inflammation. And once they're in there, what we are figuring out is they're not leaving the eye. They are there to stay. There's no way for the quail to get these parasites out once they invade the eye."

Kendall said spring rains in 2010 brought the prairies to life with increased habitat and insect numbers for the quail to eat and, for a time, quail numbers swelled. The Rolling Plains of West Texas are a major stronghold for wild bobwhite quail hunting in the United States, and many communities depend on the economic boost quail hunting brings.



Bobwhite quail populations are trying to make a comeback on the Rolling Plains of Texas after a massive die-off occurred in 2010. Credit: Texas Tech University

"It was very green and lush, and we had a lot of quail," he said. "Then, we didn't have any quail when we approached October 1. We do not believe it had anything to do with habitat. Habitat in 2010 was the best we had seen in many years. It had to be something else. We think infection with these eyeworms can negatively impact vision of quail. These birds need to be 100 percent performance ready to get away from a Cooper's hawk. If you are a quail in the wild and if you have vision impairment it could negatively impact your ability to get away from a predator."

Operation Idiopathic Decline began in 2011. The three-year project aimed to discover what might have caused the massive die-off on the Rolling Plains.

"In July of 2010, we had two major rain events of more than five inches each," he said. "That created a population explosion of insects, particularly crickets, which carry the eyeworm in a larval state. I'm convinced, based on our data, that the conditions may have been right to precipitate a massive insect population explosion, which in turn, created a quail population boom. But there was a catch."

Kendall believes that by eating crickets infected with eyeworms, quail were actually swallowing a poisoned pill. Eggs from eyeworms in quail would be left behind in the birds' feces, which in turn would be eaten by more crickets.

"There's evidence of eyeworms all over the Rolling Plains now," he said. "We need a cure; we need a strategy to cure it. So we're in the process of a major research and development effort to find a remedy. There's been evidence for some time that eyeworms were in the Rolling Plains, but we didn't know how to assess their potential impact. Maybe this might provide more interpretation of why we have such large cyclic crashes of quail. We don't know yet. One thing we do know is that there have been increased reports of quail flying into objects, such as barns and houses. This might answer why."

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