

Biologist discovers clues about frog deaths

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Dr. Anna Savage is looking to solve the mystery of why frogs are dying off around the world. Credit: UCF: Aileen Perilla

UCF biologist Anna Savage is obsessed with frogs and figuring out why they are dying at an unprecedented rate around the world.

Her latest research, published today in the journal *Proceedings of the*

Royal Society B, suggests that natural selection as well as other evolutionary forces have shaped the evolution of immune genes in lowland [leopard frog](#) populations helping them survive a deadly fungus that's killing off many other species worldwide.

And the die-off isn't just of concern to biologists.

"If there is a massive, sudden change in [frog populations](#), then maybe something in the environment is changing in a broad way that could also impact us," she said. "Fungal pathogens are on the rise, not just Bd (the chytrid fungus, *Batrachochytrium dendrobatidis*) in frogs, but there is white nose syndrome in bats, snake fungal disease, and there has been an increase in human fungal pathogens across the world. So you could argue that it's a hallmark of a broad global process such as climate change."

Savage said she doesn't have all the answers yet, but she's working on them.

The New Hampshire native has been obsessed with frogs since catching them in her backyard as a child.



UCF students help biologist Anna Savage with frog research. Credit: UCF: Aileen Perilla

"My parents were hippies and we lived with nature all around us. I was homeschooled, so I could do whatever I wanted most of the day and I would go catch frogs and play with them all the time," she said. "I have always been interested in them."

She turned her child curiosity into a scientific passion that led her to publish several articles on one species of frog living in the Sonoran desert of Arizona. She has also worked at the Smithsonian's National Zoo in Washington, D.C., trying to solve the mystery of why frogs show a wide range of susceptibility to Bd worldwide. And she was drawn to

UCF in 2015 because of the opportunity to expand her research in a region of the United States that has a wealth of amphibian biodiversity.

"Our focus is trying to understand how the frog genome interacts with environmental variables like temperature that lead to either susceptibility or resistance to the Bd fungus. It affects the amphibian's outermost skin layers where keratin is found, so much so that it doesn't allow amphibians to breathe, hydrate or thermoregulate correctly. Our research has found that some lowland leopard frog populations have evolved to tolerate infection due to variation in immune system genes than enable some individuals to survive."

Bd has been linked to the decline and even extinction of various frog species throughout the world. This week's study looked at the role frog immune genes play when an individual comes into contact with the fungus.

There are 7,000 species of amphibians in the world, and they occupy every continent except for Antarctica. In the UCF arboretum alone there are 10 frog species including leopard frogs, pine frogs and cricket frogs - and that is not counting the invasive Cuban tree frog.



UCF Biologist Anna Savage catches frogs as part of her research into why they are dying off. Credit: UCF: Aileen Perilla

"We are doing field-based work in Florida to establish a pattern, because we know the pathogen is here and we are trying to establish if there are seasonal patterns of infection and trying to figure out which species are most impacted and should be focused on in future population genetic studies," said Savage.

Savage and her team make monthly trips into the arboretum to capture

frogs, collect data and then release them.

She's also assembling a research group focused on amphibians, reptiles and their emerging pathogens. The first two Savage lab graduate students are both pursuing specific questions relating to why infectious diseases are more severe in some populations or species compared to others.

Johnathan Napier is researching the mechanism by which Bd disrupts the functions of its amphibian host, and Ariel Horner is researching how Bd and another ectothermic vertebrate disease called ranavirus are impacting Florida's reptile and amphibian communities.

"Dr. Savage is a great collaborator and does a great job making sure our projects run smoothly and that we stay on task," Horner said. "She has helped bring my project to life. I think she brings a lot of new ideas and energy to the department."

Savage said she is unlikely to shift her research focus until she gets some answers. And if anyone ever doubts her commitment, they only have to visit her office to know she practically lives among the frogs.

Her bookcases are lined with rows of green frog trinkets and toys covering almost every shelf in the room and books about all kinds of [frogs](#) are stacked everywhere.

"I really do love what I do," she said. "I guess you could say I'm a little obsessed."

Provided by University of Central Florida

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