

MOUNTAINS

New salamander species found hiding in plain sight



Word from the Smokies
Frances Figart
Columnist

Until recently, it was thought that 30 species of salamander live in Great Smoky Mountains National Park. But a recent article in *Bionomia*, the international journal devoted to biological naming, announced that what was believed to be one species of salamander has been found to actually consist of at least four distinct species, two of which live in the Smokies.

This discovery removes the black-bellied salamander from the park's salamander list and adds both the Cherokee black-bellied salamander and the Pisgah black-bellied salamander, taking the total from 30 species to 31 in the park often referred to as The Salamander Capital of the World.

"To our knowledge, these species are the first new-to-science vertebrates formally described during the time of the All Taxa Biodiversity Inventory," says Will Kuhn, director of science and research for Discover Life in America, a nonprofit park partner that manages a now 24-year-old effort to describe all the park's species and their relationships to one another.

"These salamanders represent what we call cryptic species," Kuhn explains. "Though they look the same, their DNA is different, showing that they probably don't interbreed in nature, even in places where their populations overlap."

The two men responsible for the *Bionomia* paper and the disentangling of the two species are David A. Beamer and Alex Pyron, both tenacious researchers and unflagging scientists who joined forces to parse out salamander species differences.

"I first sampled the blackbelly salamander back in 2008 during work on my dissertation," said Beamer, Ph.D., of Nash Community College and The Amphibian Foundation. "At that time, I was focused on sampling geographic units defined by river drainages and ecoregions of which the Smokies were a unique sampling area. Nobody else had included samples of blackbellies from the Smokies in any published genetic work, so it wasn't known that there were unrecognized blackbelly species in the Smokies."

Beamer's dissertation put the placeholder name for the blackbelly, *Des-*



Alex Pyron examines cryptic species of salamanders being parsed out from the original black-bellied salamander, or *Desmognathus quadramaculatus* F, first studied by a scientist from Smith College named Steve Tilley.
PROVIDED BY JASON COLSTON

mognathus quadramaculatus F, into use. Then in 2010 he began to collaborate with Pyron, and the two obtained a National Science Foundation grant to engage in genome-scale studies, which would further reveal totally distinct, new species.

"Many of these species were first hinted at by early genetic work in the 1960s through the '90s by a scientist from Smith College named Steve Tilley," says Pyron, the Robert F. Griggs Associate Professor at George Washington University. "Other research from 2005 first started to cement the idea that they were new — right around the time that Dave started his graduate studies on the genus."

In scientific protocol, the original authors of a species get to name that species. In this case, Beamer and Pyron had an idea that might bring recognition to a sense of place and the people who made these mountains their home long before

there was a Great Smoky Mountains National Park.

"I met Caleb Hickman at the 2008 Southeastern Ecology and Evolution Conference in Tallahassee," recalls Beamer. "We were both grad students at the time."

Hickman is now the supervisory fisheries and wildlife biologist for the Eastern Band of Cherokee Indians. He and Beamer have stayed in touch over the years, often conversing on the topic of salamanders.

"In 2015 Caleb invited me to come out for a Bioblitz and provided eight slots to the Beamer lab. This was an honor because spaces were limited, in part because Tribal chaperones were required for all surveys," Beamer remembers. "By this time, I had already realized that there were different blackbellies in the Smokies, and I had discussed with Caleb the possibility that they might be present outside of GSMNP on tribal lands. This turned out to be true!"

One time when Beamer and Hickman ran into each other at a conference, Hickman mentioned he was trying to create a book of all the tribal names for amphibian and reptile species on Eastern Band lands.

"I immediately realized my work was going to make his task harder," Beamer says. "But, at the same time, I realized it represented a great opportunity to directly involve the Tribe in the scientific description of some of their biodiversity heritage."

Out of respect and appreciation for the Tribe, Beamer and Pyron ultimately asked the Eastern Band of Cherokee Indians for their guidance in naming one of the Smokies species. The Tribe convened a meeting of native speakers to formulate a Cherokee name, "gvni-gewswoṭli," which translates roughly to "black belly." So, the authors named the Cherokee black-bellied salamander *Desmognathus gvni-gewswoṭli*.

For the scientific name of the other Smokies species, the Pisgah black-bellied salamander, Beamer and Pyron chose *Desmognathus mavrokoilius*, in which "mavrokoilius" is Greek for "dark belly."

These two species are only known to overlap in the northeastern portion of the park and cannot be told apart with-

out genetic testing. Also, they are not thought to be especially close to each other on the salamander family tree. Back in 2019, when the researchers had needed salamander specimens from the park to determine the true identities of the two new species, Pyron worked closely with Paul E. Super, science coordinator at the Appalachian Highlands Science Learning Center.

"We thought we knew all the vertebrates in the park, but through cryptic species, furtive species, and human-caused translocations, we keep adding to the list," says Super. "We added the Cumberland slider turtle in 2003, the green treefrog in 2012, the brown-headed nuthatch in 2013, least weasel in 2014, Ross's goose in 2017, and both the Lapland longspur and the nine-banded armadillo in 2019."

Because we humans have a keen interest in learning about fellow backbone-possessing creatures, most vertebrates were cataloged long before the All Taxa Biodiversity Inventory began in 1998. Since then, only about 35 new vertebrates have been added — roughly half of them birds.

"That's 0.3% of the total species added since the ATBI began," Kuhn says. "For comparison, insects make up 56% of discoveries, and fungi — including lichens — make up 17%. There just aren't that many vertebrate species compared to some of the more diverse groups, and that's why this rarity is so interesting."

With the announcement of another new species coming out in the next few weeks, it's likely that additional cryptic salamander species are out there in plain sight just waiting to be discovered.

DLIA's third annual Salamander Ball on Wheels will be held Oct. 7 at the Parkway Drive-in Movie Theater in Maryville, Tennessee. Learn more at DLIA.org.

Frances Figart is the editor of *Smokies Life* and the Creative Services Director for the 29,000-member Great Smoky Mountains Association, an educational nonprofit partner of Great Smoky Mountains National Park. If you are interested in reading a full-length magazine article about Beamer and Pyron's separating of salamander species, reach out to her at frances@gsmassoc.org.

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