

# Head shape and genetics augment understanding of rattlesnake species

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A new analysis found that some subspecies of the western rattlesnake actually may be separate species. Credit: Bryan Safrantowich

Using head shape and genetic analyses, new research challenges the formerly designated subspecies within the western rattlesnake species. These findings have important implications for ecological conservation efforts across the United States and could provide the basis for new species designations.

The results are published in the journal *PLOS ONE*.

The western rattlesnake (*Crotalus viridis*) is found across a significant portion of the United States, from Mexico to Canada and from the Missouri River to the West Coast. Most work classifying rattlesnake [species](#) and subspecies was conducted in the mid-20th century. Since then, scientific methods have advanced to allow for a more comprehensive understanding of the path of rattlesnake evolution.

Mark Davis, a research scientist at the Illinois Natural History Survey, part of the Prairie Research Institute at the University of Illinois, collected data from nearly 3,000 western rattlesnakes for this study. He gathered data from preserved samples of this group available at natural history museums across the western United States.

"We are able to see that these different subspecies, which have different habits, live in different areas and have other different characteristics, have heads that have been shaped differently over evolutionary time," Davis said.

For western rattlesnakes, the head is the primary organ for conducting daily life. It is especially important for feeding and reproductive rituals. Head shape has evolved to better accommodate these critical behaviors, Davis said. The shape can vary drastically between different species of snakes. Given the importance of this feature, Davis and his colleagues used geometric morphometrics, a relatively novel method that allows researchers to quantify head shape without any influence of head size.

To complement the shape analyses, Davis and his team analyzed genetic data from the snakes. Combining head shape and genetic information created a comprehensive perspective, Davis said. Together, these data confirm that several groups of snakes previously labeled as subspecies have substantial enough differences to qualify for a separate species designation.

One of the greatest challenges to ecological conservation is identifying what species actually exist. For legal protections - including the Endangered Species Act - to be effective, scientists must specifically identify the units of biodiversity that may be in need of protection.

"It's important to me to try to work with conservation practitioners to develop strategies for preserving biodiversity," Davis said.

With this study, Davis and his colleagues recommend officially elevating to the level of full species several groups of snakes previously believed to be subspecies. Davis expects that the national and international organizations responsible for naming various species will adopt the recommendations proposed in the study.

**More information:** Deconstructing a Species-Complex: Geometric Morphometric and Molecular Analyses Define Species in the Western Rattlesnake (*Crotalus viridis*), [dx.doi.org/10.1371/journal.pone.0146166](https://doi.org/10.1371/journal.pone.0146166)

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