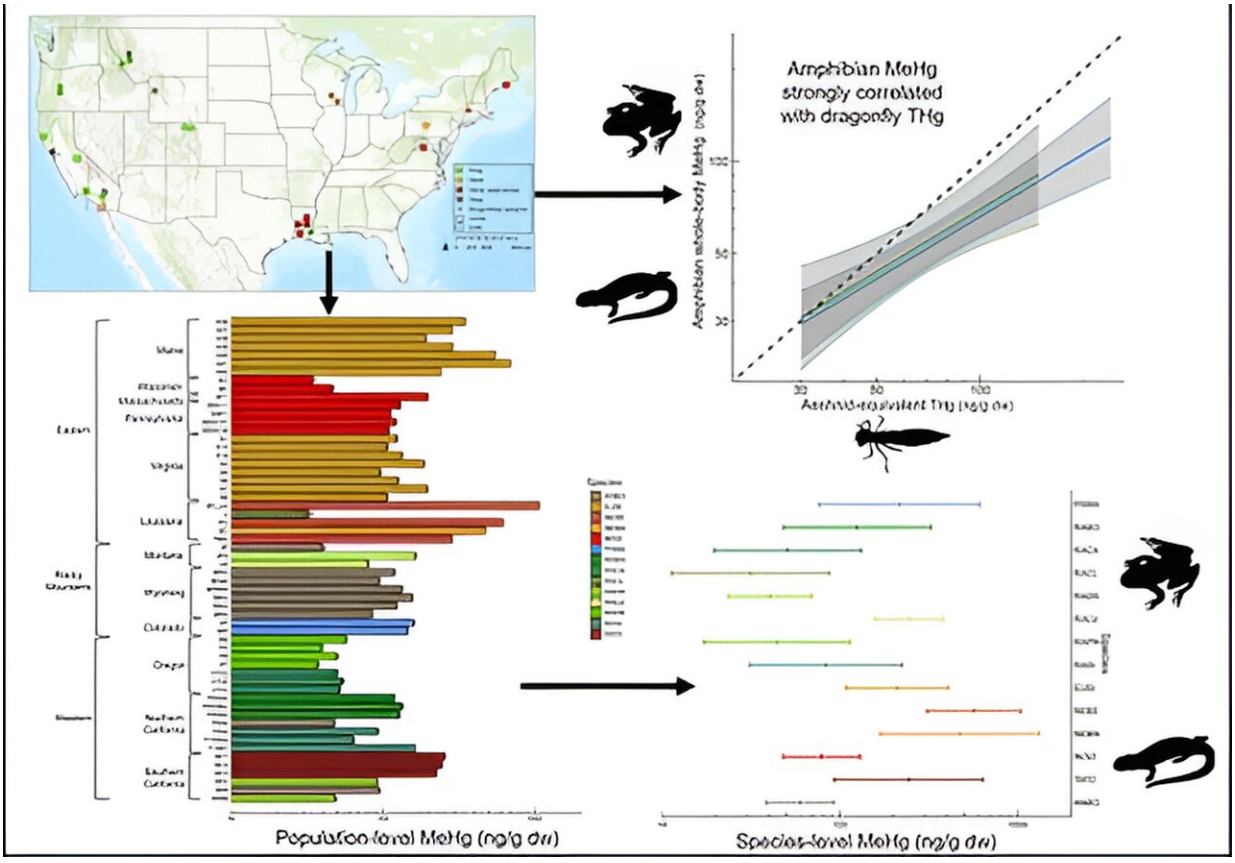
New study shows that amphibians have one more thing to worry about: Methylmercury

October 30 2023



Credit: *Environmental Science & Technology* (2023). DOI: 10.1021/acs.est.3c05549

The first widescale assessment of methylmercury in adult amphibians in the U.S. to date shows that in amphibians, this toxic compound is

common, widespread, and at least for some, can reach very high levels.

The study, "Broad-scale Assessment of Methylmercury in Adult Amphibians," which published today in the journal *Environmental Science and Technology*, brought together scientists from around the country to test more than 3,200 amphibians representing 14 species from 26 populations.

"Amphibians are the most endangered group of vertebrates worldwide, but until this study, we knew relatively little about the variability of mercury bioaccumulation in amphibians" said Anne Kinsinger, USGS Associate Director for Ecosystems. "Trailblazing USGS science, like this study, provides a solid foundation for research and helps managers address the most pressing issues facing fish and wildlife conservation."

The amount of methylmercury in amphibians varied by site and by life history characteristics—such as diet, size and sex. Amphibian methylmercury concentrations in this study ranged from barely detectible at some locations, to levels well above wildlife health benchmarks in others.

Although the variation in concentrations between amphibians was large, with the highest measurement 33 times more than the lowest, it was much less than the variation reported for other animals like dragonflies, fishes and birds. The authors suggested the lower variation among amphibians was possibly because they collected samples mainly from wetlands whereas the studies on the other animal types collected samples from a larger diversity of habitats.

Contaminants, such as mercury—a contaminant of global concern because it is harmful to humans and other animals—are suspected to be one reason amphibians are declining, though scientists haven't teased out mercury's role, if any, in their decline.

Often formed by microbes living in water, methylmercury is the most bioavailable form of mercury that is highly toxic to vertebrates. It enters the food web and is hard for animals to get rid of once internal, so it accumulates in animals as they continue to feed, a process scientists call bioaccumulation.

"Despite its toxicity, scientists only have a limited understanding of methylmercury's effects on amphibians," said Brian Tornabene, USGS Post-doctoral Researcher and the study's first author. "The results from this study can be used to inform future research on the health effects of methylmercury exposure on amphibians, which for some was very high."

Study author and lead for the USGS Amphibian Research and Monitoring Initiative Michael Adams noted that this study also provides new methods and baseline data that can help scientists and managers assess the risk from mercury for species of management concern, including species listed as threatened and endangered under the Endangered Species Act.

The study even found a way to understand mercury bioaccumulation for amphibians that can't be sampled—by using dragonfly larvae. Scientists determined that the concentration found in these insects are a good stand-in for estimating the amount of methylmercury bioaccumulation in amphibians, and there is already a nationwide USGS/National Park Service project underway sampling them.

A recent report by the IUCN showed that habitat loss was the greatest threat to amphibians, but their reliance on aquatic habitats also makes them susceptible to environmental contaminants like mercury. Scientists are only just starting to understand how exposure to contaminants contributes to amphibian population dynamics or how contaminants might interact with other threats, like disease. Part of understanding how exposure contributes to decline is determining how exposure varies, and

this study provides the most complete picture to date of variation in methylmercury in amphibians.

More information: Brian J. Tornabene et al, Broad-Scale Assessment of Methylmercury in Adult Amphibians, *Environmental Science & Technology* (2023). DOI: 10.1021/acs.est.3c05549

Provided by United States Geological Survey