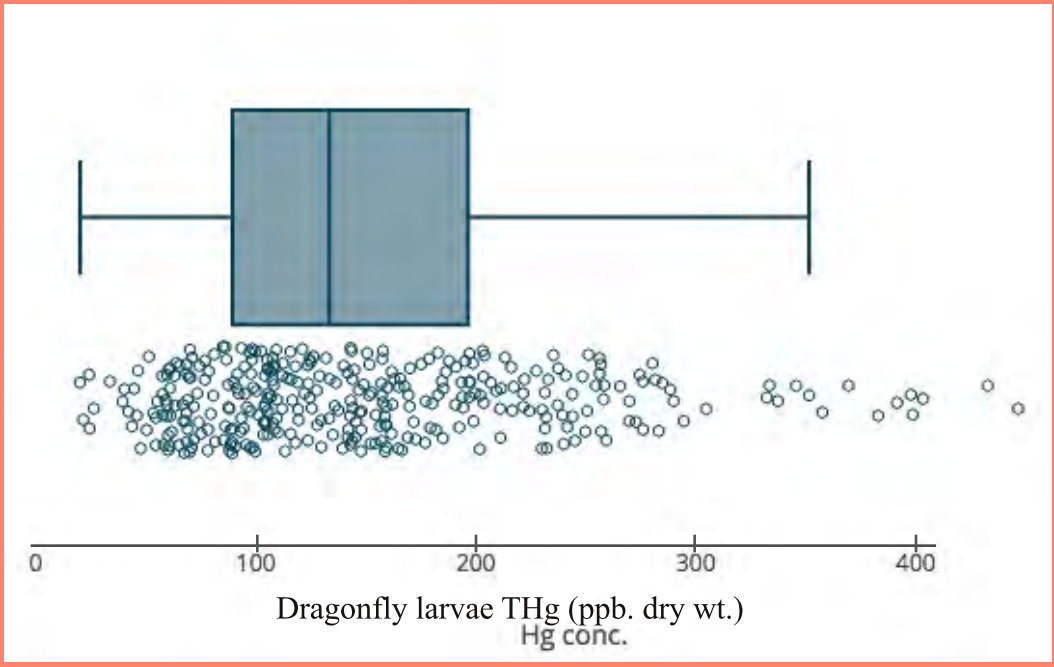
How variable are mercury concentrations in dragonfly larvae?

Researchers are using dragonfly larvae to understand how mercury moves in the environment and how mercury ends up in animals in some locations around the U.S., but not in other locations.

Photo courtesy of Kingfisher Photography

Dragonfly larvae are a good organism to use for this research because they live in waterbodies everywhere, including places where fish do not live. And, they are predators—which means that although they are small, if there is mercury in the waterbody where they live it will also be in the dragonfly larvae. To really understand how mercury moves in the environment the researchers need a lot of dragonfly larvae from a lot of different environments across the U.S.

To help with this research effort citizen scientists have collected over 400 dragonfly larvae from National Parks across the country in 2013. Before digging into the data to answer the big question (What do dragonfly larvae tell us about how mercury moves in the environment?) researchers must first understand a lot of smaller questions. And one of those questions is: How variable is the mercury concentration in dragonfly larvae? Are the mercury concentration data spread out or clumped? Is there a wide range of values or a narrow range? The graph below displays the variability of the dragonfly larvae mercury concentrations.



Using everyday language describe the variability of mercury concentrations in the dragonfly samples collected in 2013 for this project.

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How does dragonfly family affect mercury concentrations?

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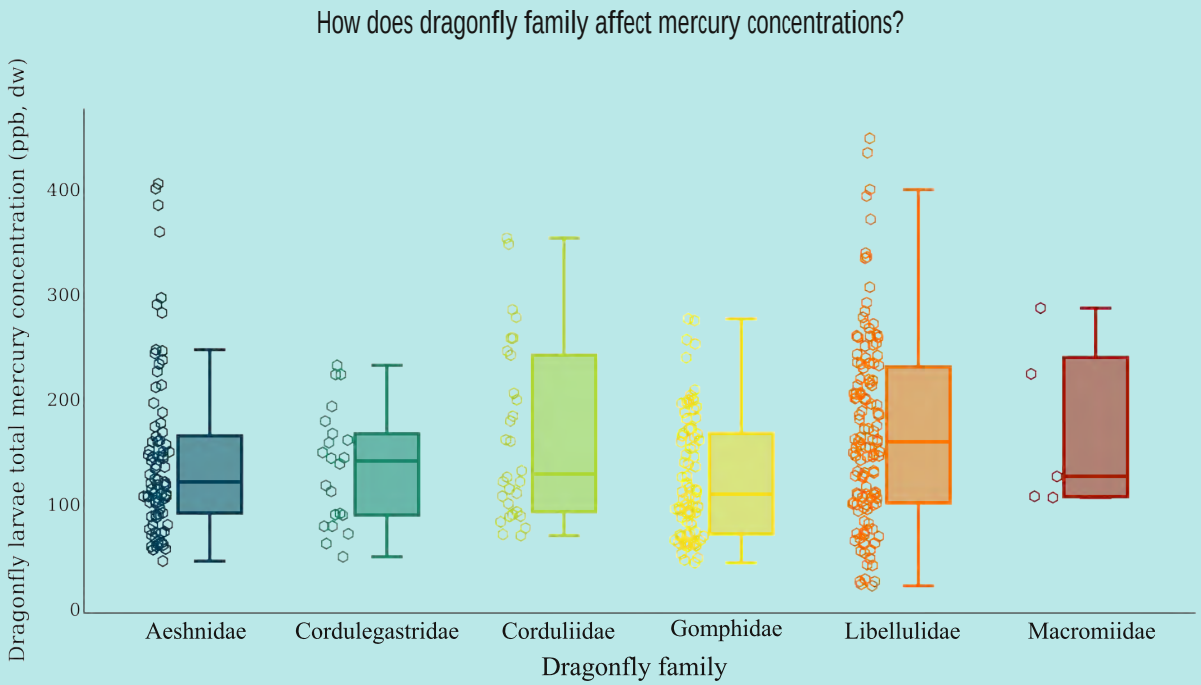
There are six groups, or families, of dragonflies in the U.S.: Aeshnidae, Gomphidae, Cordulegastridae, Macromiidae, Libellulidae, and Corduliidae. Each family has a different living style and can be found in different types of waterbodies. These differences have the researchers wondering—How does dragonfly family affect mercury concentrations? If the families are not all equally good at showing a mercury 'signal' then perhaps the researchers will only want their citizen science partners to collect the dragonfly families that are good at taking up mercury.

To test whether all the dragonfly families take up mercury similarly (that no family shows a huge or a very small signal compared to the other families), researchers compared the mercury concentrations of dragonflies from the six different families.

Representative samples of the dragonfly families.
Photo courtesy of Kingfisher Photography



Describe the variability of mercury concentrations in the different families in the graph. Interpret the data—should citizen scientists continue to collect dragonflies from all of the dragonfly families, or should they not? Why?

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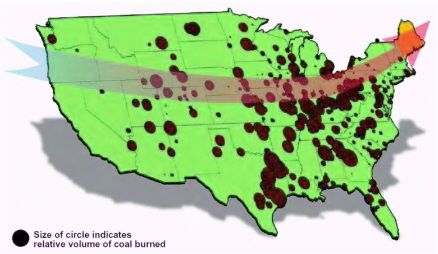
How does longitude affect dragonfly larvae mercury concentrations?

There are a number of factors that influence how mercury gets from the atmosphere into an animal like a loon, a frog, or a dragonfly. Researchers are trying to understand what happens to mercury in the environment and why, in some places, the mercury is more readily available for animals to take up than in other places.

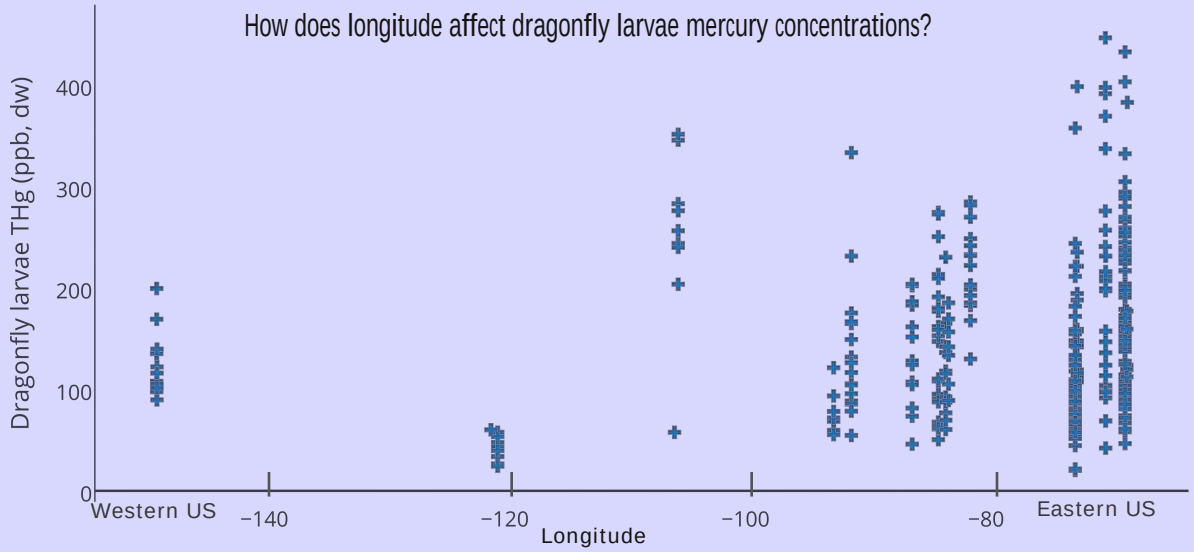
It seems that no one factor that can totally explain the patterns of mercury in wildlife around the U.S. (and around the world), but what is the relative importance of a lot of different factors?

One factor to explore is longitude, or how far to the east or west did the dragonfly sample come from? The prevailing winds across the U.S. are from the west to the east and mercury can be carried to places that are downwind of mercury emitters, like much of the northeastern U.S.



Map courtesy of Portland Press Herald, Portland, Maine, USA. Source: United States Energy Information Administration, E-3 Ventures (USDOE, 1999), adapted from Bank et al. 2005.

The graph below shows dragonfly mercury concentrations relative to the longitude of the waterbody that the dragonfly was collected from. The longitude is on the X-axis and is a negative number as it is a measure of how far to the west the sampling location is relative to the Prime Meridian (which runs through Greenwich, England and has a longitude of 0). The more negative the number, the more western the sampling location.



1. Describe what the graph shows about the relationship between longitude and mercury concentration.

2. What happens to the variability in the mercury concentrations as the longitude gets closer to zero (or farther east)?

3. Interpret the graph below to make the call—What is the relationship between longitude and mercury concentration?

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