

Roly polies transfer environmental toxins to threatened fish populations in California

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California's Big Creek meets the Pacific Ocean on the rugged stretch of coast known as Big Sur. New research finds steelhead trout in Big Creek accumulate mercury in their bodies when the fish eat roly polies and similar terrestrial bugs that fall into the water. Credit: Dave Rundio.

Roly poly bugs may be a source of fun for kids and adults but these little bugs that form into balls at the slightest touch are causing problems for some threatened fish.

New research finds steelhead trout in a stream on the California coast accumulate [mercury](#) in their bodies when the fish eat roly polies and similar terrestrial bugs that fall into local waterways. The new study corroborates earlier findings that mercury can make its way to the top of the food chain in coastal California.

The results show for the first time that roly polies and other bugs are transferring high levels of the toxic metal to fish in an otherwise pristine watershed where environmental contaminants are not known to be a concern, according to the researchers.

"Our research is the first step in identifying [mercury] as a potential stressor on these populations," said Dave Rundio, a research fishery biologist at NOAA's Southwest Fisheries Science Center and co-leader of the study that will be presented 8 December at AGU's Fall Meeting 2020.

It is unclear whether mercury accumulation in steelhead and other species would affect humans, but the findings suggest mercury can move between connected ecosystems and affect threatened or endangered species in unsuspecting ways, according to the researchers.

Tracing mercury's path

Mercury is a toxic metal that can cause neurological and developmental problems in humans. Some mercury occurs naturally and is not harmful to living things, but certain bacteria convert elemental mercury into an active form that can become concentrated in the tissues of living organisms and accumulate in larger and larger amounts up through the

food web.

A 2019 study by Peter Weiss-Penzias, an atmospheric chemist at the University of California Santa Cruz, found mercury from coastal California fog can make its way to the top of the terrestrial food chain and reach nearly toxic levels in the bodies of pumas.

In the new study, Rundio wanted to see if mercury can accumulate in top predators in aquatic ecosystems as well as on land. Rundio, Weiss-Penzias and other colleagues looked specifically at mercury levels in steelhead trout, a kind of rainbow trout that are one of the top sport fish in North America and culturally important to some Native American tribes.

The researchers took samples of [steelhead trout](#) and their prey from a stream in the Big Sur region of central California to see if they had elevated mercury concentrations in their tissues and to determine where that mercury came from.

Steelhead are predators with a varied diet in freshwater, eating anything from small fish and crustaceans to insects and even salamanders that fall into streams. Interestingly, terrestrial bugs like roly polies make up nearly half of a steelhead's diet in streams in coastal California.

The researchers found steelhead had elevated mercury levels in their tissues, and the older, more mature fish had more mercury than juveniles. Some of the mature stream trout they sampled had mercury concentrations that met or exceeded water quality and food consumption advisory levels.

From fog to fish

The researchers also found the terrestrial bugs the fish eat—most notable

roly polies, which are a non-native species from Europe—had higher mercury concentrations than their aquatic counterparts. The findings suggest mercury rolls into coastal California through fog, is consumed by roly polies eating leaf detritus and water droplets, and moves up the food chain to the [fish](#)—similar to Weiss-Penzias's findings of how mercury makes it up the terrestrial food chain to pumas.

The new findings came as a surprise to Rundio because the steelhead they sampled live in a nearly pristine environment scientists thought to be free of environmental contaminants.

It is important to know where mercury accumulates in the environment and food webs because it a difficult toxin to get rid of, said Weiss-Penzias, who will present the work. Some toxins can be diluted enough in the environment that they become essentially harmless, but mercury becomes more concentrated as it moved up the [food](#) chain.

"We have to think of mercury in that sense and be extremely concerned about it because of the continual releases of coal combustion, gold mining, and other industrial processes," Weiss-Penzias said.

More information: [agu.confex.com/agu/fm20/webpro...
ram/Paper675388.html](https://agu.confex.com/agu/fm20/webprogram/Paper675388.html)

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