

Study finds PFAS in all tested Lake Michigan sportfish and their prey

WHEN IT COMES TO PFAS, scientists have found these “forever chemicals” in soil, water and air in sites around the country and the world. Now, researchers have found PFAS in every Lake Michigan fish they sampled and a particularly toxic form of PFAS in most of the lake’s sportfish.

PFAS is short for per- and polyfluoroalkyl substances, which encompass thousands of compounds that don’t break down in the environment. They are used in many everyday items like nonstick cookware, water- or stain-resistant clothing or carpeting, cosmetics, and even toilet paper.

Along with their persistence and growing presence in the environment, these chemicals may have human health impacts, such as impairing one’s immune system, increasing the risk of some cancers, and delaying development in children.

With funding from IISG, scientists from the University of Notre Dame—led by biologist Gary Lamberti and nuclear physicist Graham Peaslee—set out to assess the presence of PFAS in Lake Michigan fish and how these chemicals move through the lake’s food web, which had not been previously studied.

“We tested over 100 sportfish—chinook salmon, coho salmon, rainbow trout and native lake trout—and another 100 or so prey fish from all four quadrants of Lake Michigan,” said [Daniele De Almeida Miranda](#), a postdoctoral associate working on the project.

They found PFAS in all sampled fish, both predator and prey, and in similar amounts and composition throughout the lake. The good news in terms of Lake Michigan—the study showed PFAS levels were lower than levels detected in most other Great Lakes.

Of notable concern though, was the widespread presence and level of PFOS (or perfluorooctane sulfonic acid) in the lake’s fish. These compounds were identified in more than 95% of sampled fish, especially salmon and trout.

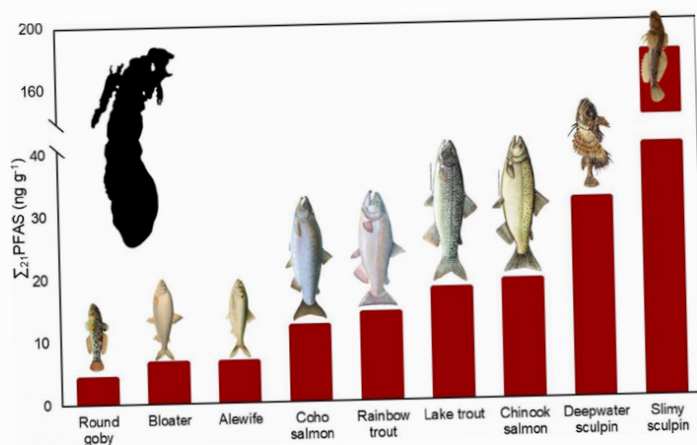
“PFOS are a type of PFAS that are very toxic, even in low concentrations,” said Miranda. “For that reason, these compounds were phased out of production in 2002. Over 20 years later, PFOS are still the main PFAS compounds that we

are seeing in Lake Michigan fish.”

These dangerous substances were also more likely than other tested PFAS compounds to bioaccumulate, meaning to move up the food chain from smaller to larger fish, potentially resulting in higher concentrations in popular sportfish.

“While bioaccumulation is straightforward with some contaminants, such as PCBs or heavy metals, it’s not with PFAS,” said Miranda. “For some PFAS compounds we found higher levels in predator fish such as chinook and lake trout, than in prey fish, but sometimes it was more variable.”

Lamberti noted that PFAS uptake by fish can be complicated, and many





factors might play a role, such as the smaller fish's diet or whether they spend time near the lake's sediments, where PFAS might accumulate. "For example, small bottom-dwelling fish called sculpin had the highest PFAS concentrations of all the fish tested," he said.

Also part of this IISG project, Peaslee developed a quick and affordable screening tool using technology that involves particle induced gamma-ray emission (PIGE) for analyzing PFAS and the researchers adapted the process for sampling fish tissues. This new approach provides a measure of total fluorine levels, which are a useful indicator of the presence and the amount of PFAS in fish.

The PIGE method was tested using a subset of this project's sample fish and next steps include expanding that number.

The research team expects this first look at PFAS and their movement through the Lake Michigan food web to help decision makers evaluate the extent of these pollutants in the ecosystem and in sport fish, which may ultimately be on someone's dinner plate.

This study is published in the journal [Science of the Total Environment](#). ✓

Should I eat fish caught from Lake Michigan?

Illinois-Indiana Sea Grant also supported research to assess just how much we still need to learn about PFAS and their chemical relatives PFOS and PFOAs. A series of discussions with scientists and other experts highlighted that PFAS levels in fish are highly variable, changing with place, time, and species; fish consumption is one of many significant ways to be exposed to PFAS, and may not be the most important one in all communities; and more research to better understand PFAS and fish consumption is underway. Stay tuned for the latest information. ✓

Tracking Fish in Chicago's Loop



ILLINOIS-INDIANA SEA GRANT, Shedd Aquarium, and Purdue University are studying fish behavior in the downtown waters of the Chicago River. Like many of the world's urban rivers, the Chicago River has been channelized, straightened, deepened, and tied to the city's sewer system.

This summer, researchers began their Chicago River Acoustic Telemetry Array project by equipping 80 fish, including largemouth bass, common carp, and bluegill with acoustic tags. Receivers in the water listen for nearby tagged fish and store the tag ID as well as the date and time.

Fish tracking can help researchers understand how fish are using certain restoration initiatives, such as artificial floating islands, as well as identify critical spawning habitat, key overwinter areas, movement patterns, and home ranges. ✓