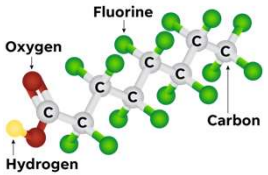
Measuring Per-and polyfluoroalkyl substances (PFAS) in Fish and the Potential Impacts on Human Health & the Environment

By: Aminata Ndiaye, University of Michigan & Ecology Center

Concern over PFAS contamination has continued to arise on the community level. How can we better understand the extent of contamination in communities, develop strategies to educate those affected, and improve overall health through government policy?

What Are PFAS?

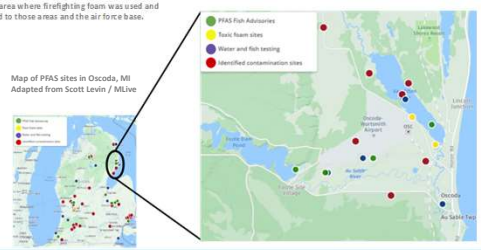
Per- and polyfluoroalkyl substances (PFAS) are a class of thousands of chemicals widely used in manufacturing and consumer products. These chemicals have been detected in drinking water, surface water, fish, wildlife, and other environmental media across Michigan. PFAS don't break down in nature and build up in the food chain earning them the nickname **"forever chemicals"**. Scientific evidence is building up against these chemicals, linking them to many diseases in people.



Many PFAS sites are under investigation in Michigan resulting in "Do Not Eat the Fish advisories"

- In Oscoda, Michigan, firefighting foam containing PFAS was used in trainings at the former Wurtsmith Air Force Base, which operated from 1923-1993. Additionally, the foam was used around the city to assist local firefighters multiple times.
- This foam is now being investigated as a source of long-time exposure to PFAS from ground water contamination.
- Clark's Marsh, which is near the base, is now a site where fishing is banned due to high levels of PFAS found. Fish are sentinel species that demonstrate bioaccumulation and effects from chemical run-off.
- More testing is needed around Michigan to determine the extent of contamination and to better protect anglers and the affected communities.

Map of Oscoda area where firefighting foam was used and locations related to those areas and the air force base.

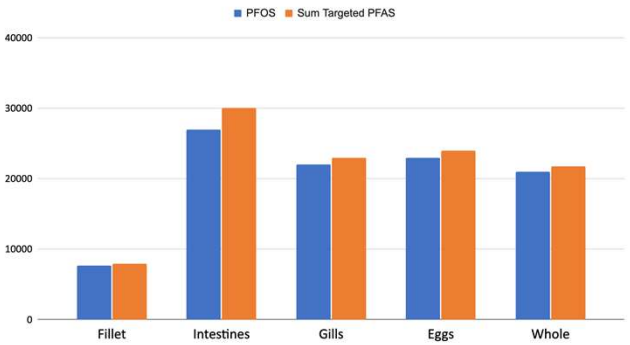


Study Objectives:

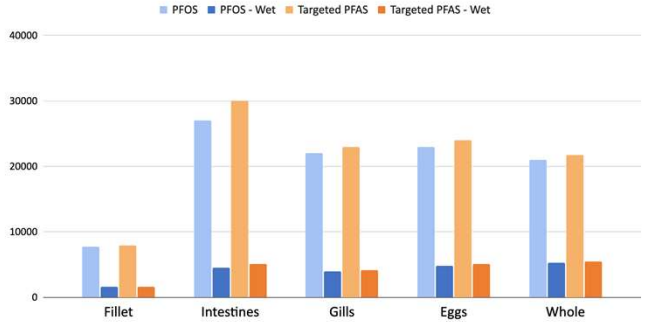
Develop a pilot program utilizing community-based participatory research to:

- **Identify PFAS hazards in different fish species in Clark's Marsh**
- Educate and protect anglers, especially subsistence anglers and communities of color.
- Suggest modifications to regulations that the Michigan PFAS Action Response Team can implement .
- Create a formalized approach to community-based research that involves community stakeholders as equal partners in all steps of the process.

Pilot Fish Data, ng/g (ppb) on a freeze dried fish basis



Freeze Dried vs Wet: 80% reduction of weight from freeze drying, ng/g, ppb



Conclusions:

PFAS are present in all parts of the fish in high concentrations.

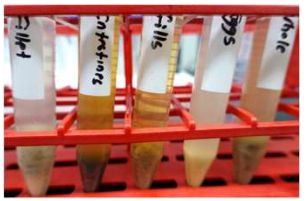
- PFOS was the most present chemical out of 40 targeted PFAS compounds, so the firefighting foam is probably the main source of contamination because it has mostly PFOS.
- Levels of PFAS in organs are ~3X higher than levels in fish fillets.
- Concentrations in wet fish were 20% less than the concentration in freeze dried fish.

Collection, Sample Preparation, and Testing Procedure

October 2021 - December 2021

1. Oscoda anglers caught fish from Clark's Marsh
2. Anglers and samplers followed EGLE PFAS sampling guide
3. Fish were stored in plastic bags in the freezer
4. Thawed fish were filleted and dissected.
5. Liver, eggs, gills, and intestines were removed for individual sampling
6. One whole fish was blended to be one sample
7. Homogenized sample and individual samples dry freezed
8. Individual samples were homogenized
9. Samples were separated by weight
10. Samples shipped to four labs for different targeted analyses

Dissected wet fish.



Fish extract samples with solvent at the EnviroLab.

Freeze dried fillet.
Left: Before homogenization.
Right: After homogenization.

Blended whole fish before freeze drying.

What Do These Results Mean for Anglers, Wildlife, and Surrounding Communities?

A change in regulatory standards can positively impact human, environmental, and concerned species health.

- Regulators should routinely monitor and test all parts of fish due to organs' high concentration of PFAS, which wildlife consume beyond the fillet.
- Regulators should consider testing freeze dried fish to get proper concentrations of fish substance.
- High concentration of PFAS in fish could be an indicator for water supply contamination and other health concerned areas.

Acknowledgements

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