



PFAS in Alaska Commercial Fish Stocks



Coho Salmon
Oncorhynchus kisutch

NOAA NOS/NCCOS and NOAA NMFS/AFSC

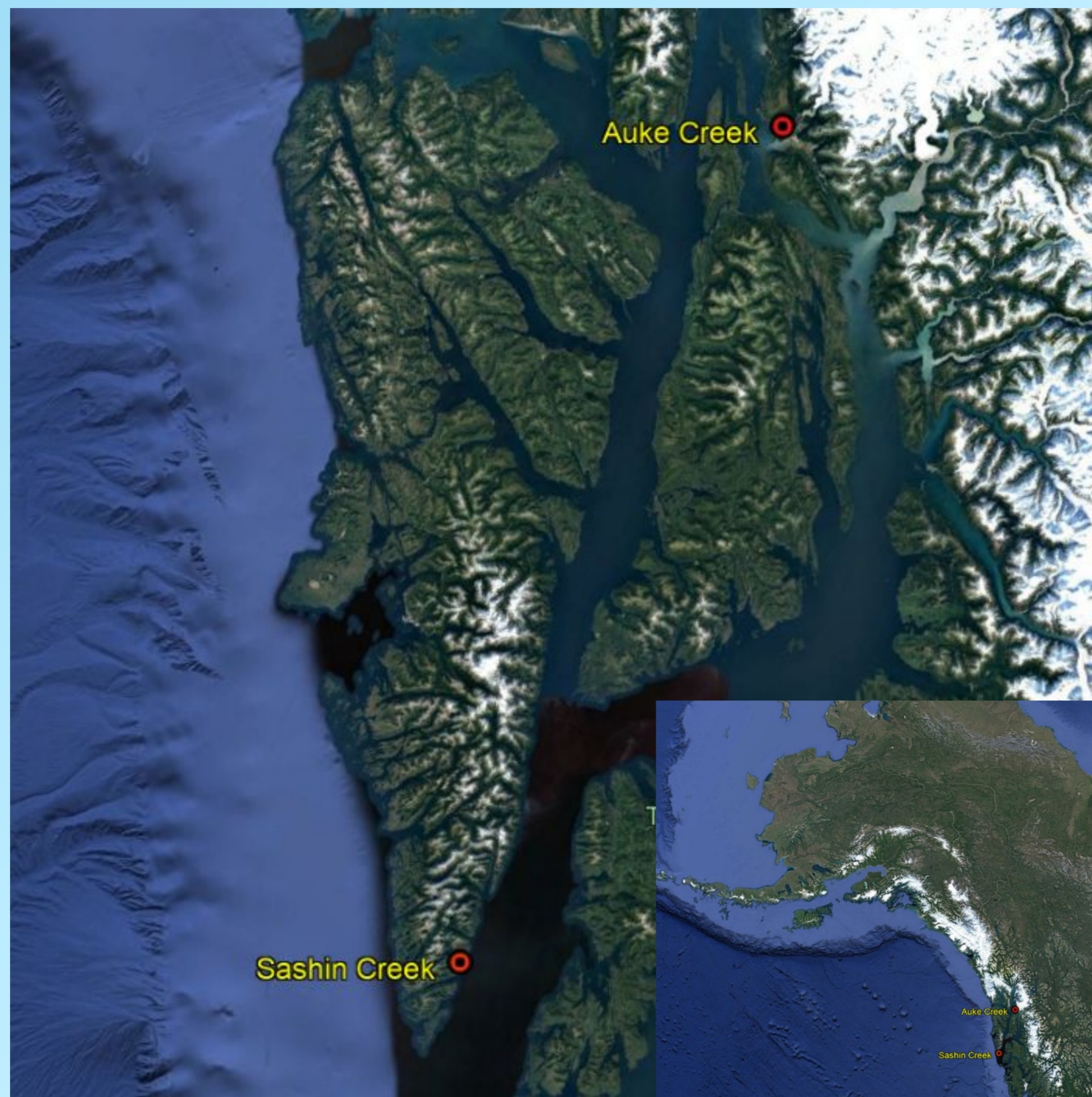
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Abstract

NOAA's National Centers for Coastal Ocean Science (NCCOS), and the Auke Bay Laboratories of NOAA's Alaska Fisheries Science Center (AFSC), are working to assess per- and polyfluoroalkyl substances (PFAS) contamination in juvenile and adult pink, coho and Chinook salmon in Alaska.

Over a 5-year span, fish are being collected on site at Sashin Creek at the Little Port Walter Marine Research station (LPW) and Auke Creek Research Station (ACRS). A suite of 28 PFAS are being analyzed in an outgoing juvenile cohort and then in returning, mature adult pink, coho and Chinook salmon associated with the cohort sampled as juveniles. The goals of the project are to better understand the transport potential of these man-made chemicals across urban and industrial complexes to near-pristine environments, assess their bioaccumulation potential in coastal and open ocean environments using commercial fish stocks, and elucidate biomagnification pathways through food chain processes.



Location of Sashin Creek and Auke Creek.

- Year 1 results indicated elevated levels of perfluorooctane sulfonic acid (PFOS) in juvenile coho salmon from Sashin Creek, in some cases above established consumption guidelines.
- In Year 2 samples, PFOS was not as prevalent, and concentrations of individual PFAS in samples were fairly low and with one exception, less than 5ppb (ng/g) total PFAS.
- Year 3 samples have been collected and are currently being analyzed.

Introduction

There are over 8,000 PFAS (per- and polyfluoroalkyl substances) chemical compounds, which have been used in a wide range of commercial applications from stain-resistant coatings to foams commonly used in firefighting exercises and incidents at airports. PFAS, termed "forever chemicals", are now ubiquitous environmental contaminants with the potential to bioaccumulate, and linked with reproductive, developmental, and immunological effects, and at least two PFAS compounds (PFOS and PFOA) appear to be carcinogenic.

Alaska salmon stocks are important commercially and in supporting subsistence communities, and are protected under international treaties. Tribal communities surviving primarily on salmon sources are at a high risk of exceeding safe consumption advisories for these compounds, yet there is little information for issuing restrictions or enacting regulations to prevent over consumption. In addition, stakeholders of the North Pacific Fisheries Management Council (NPFMC) have also expressed concerns about PFAS contaminated fishery stocks. Some states, such as Michigan, have proposed consumption guidelines for certain PFAS compounds in fish.

Methods

- In Year 1, AFSC and NCCOS personnel collected juvenile pink and coho salmon from Sashin Creek and Auke Creek for analysis of PFAS.
- A total of six samples, each consisting of multiple juvenile fish were collected and analyzed for a total of 28 PFAS compounds.
- In Year 2, a total of 35 tissue samples (i.e., muscle, liver, and kidney) were collected from returning pink and coho salmon in Auke Creek, Sashin Creek, and also in Mist Cove located approximately 8 km north of Sashin Creek.
- All samples collected were shipped to TDI-Brooks, International, a NOAA contract laboratory, and analyzed for a suite of 28 PFAS compounds.

Next Steps

- Juvenile coho salmon collected in Year 3 of the project to assess if PFOS is again elevated in whole fish juveniles from the relatively pristine Sashin Creek.
- Chinook salmon juveniles (whole fish) added in Year 3 of the project to assess PFAS in this species.
- Various tissues (muscle, liver, gonad, and kidney) are also being collected from adult Chinook to assess total and individual PFAS.
- Work to sample multiple year classes to look at PFAS source (land vs. sea) and bioaccumulation.
- Determine if assessing PFAS in other commercial fish species and in other areas in Alaska is warranted.

Results

Year 1

- PFOS was elevated in the coho salmon samples from Sashin Creek.
- The highest concentration of PFOS detected was 23.1 ng/g in one fish sample, and 19 ng/g (ppb) wet weight in a second fish sample from Sashin Creek.
- Concentrations of PFOS exceeded a Michigan PFOS guideline, that would limit the consumption of adult fish to 1-2 meals per week (Figure 1). An Auke Creek Coho sample had a PFOS concentration of 1.57 ng/g.
- Other PFAS compounds analyzed in the samples from Year 1 were less than 1 ng/g.

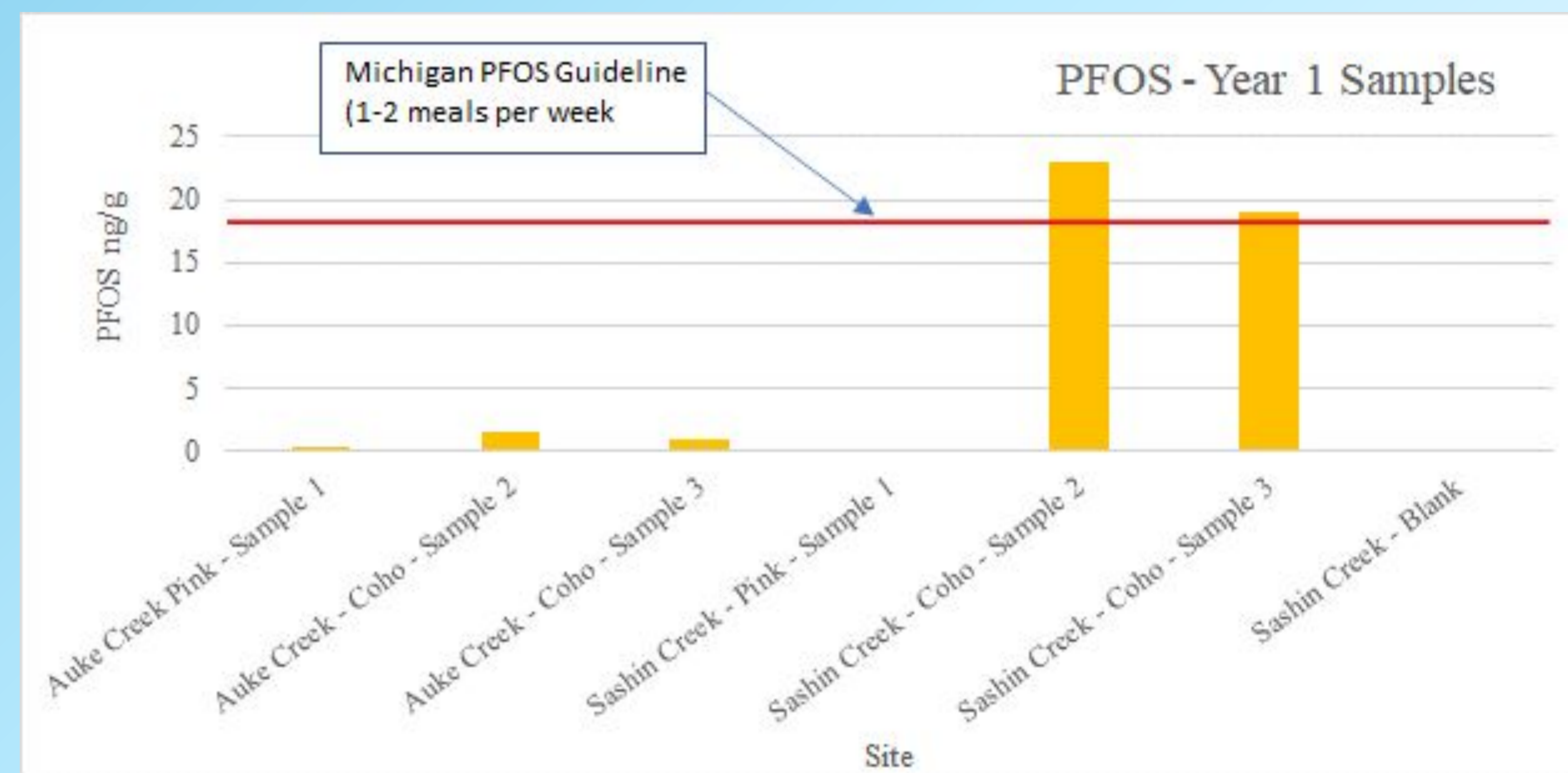


Figure 1. Concentration of PFOS found in salmon collected in Year 1.

Year 2

- PFOS was not prominent in Year 2 samples compared to Year 1.
- The highest concentration of PFOS in Year 2 samples was less than 1 ppb (0.724 ng/g) in a coho liver sample from Auke Creek.
- The highest concentration of any PFAS compound analyzed in Year 2 was 6.617 ng/g PFOSA, found in a salmon liver (Figure 2).
- HFPO-DA, also known as GenX, a "next generation" PFAS compound, was found in Sashin Creek pink salmon kidney samples.
- From an initial statistical analysis from Year 2, few differences in PFAS between fish and locations, some differences in concentration of PFAS between organs.
- In general, concentrations of some PFAS in muscle samples appeared lower than in liver or kidney, but most were not significant (Figure 3).

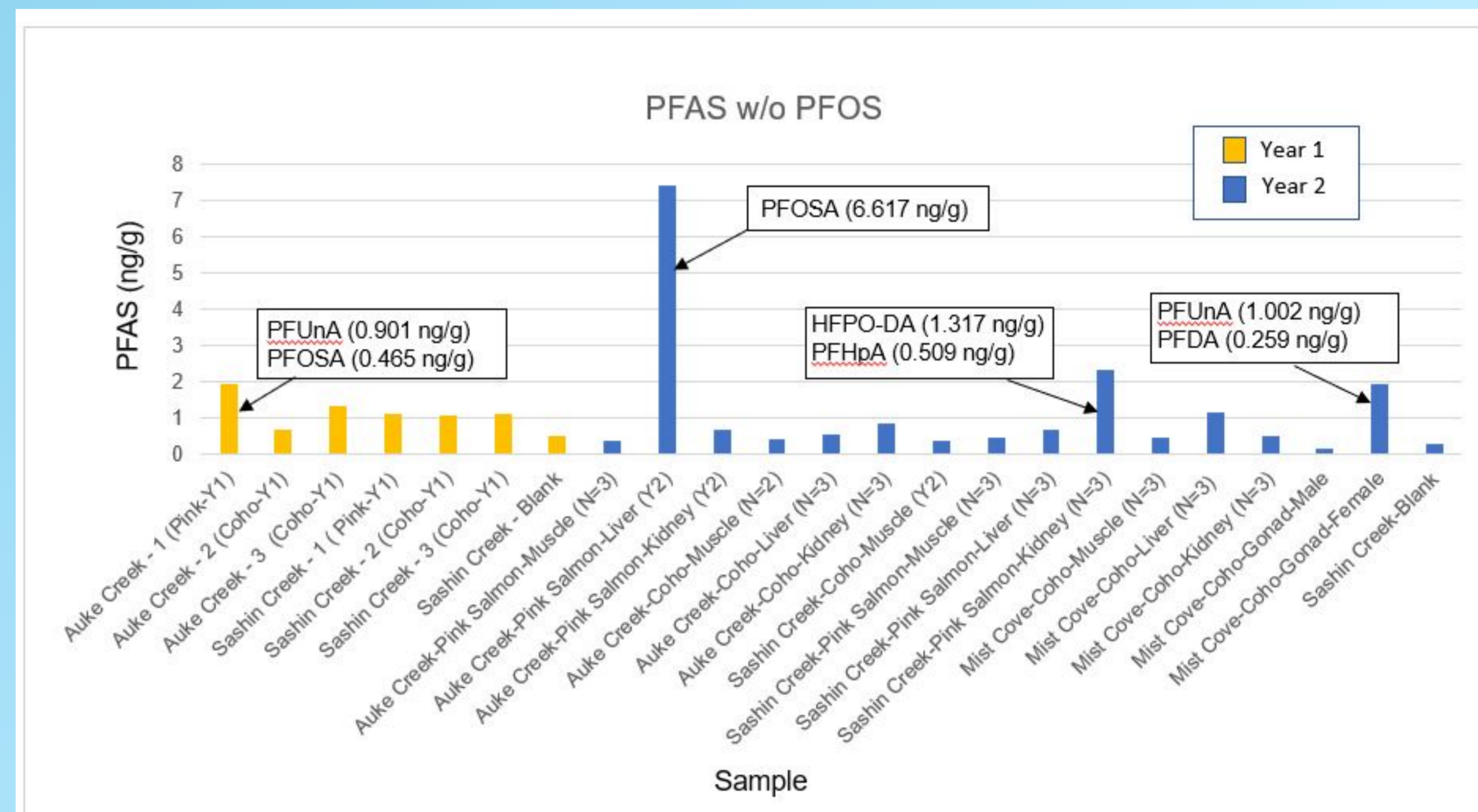


Figure 2. Concentration of various PFAS found in salmon collected in Year 2.

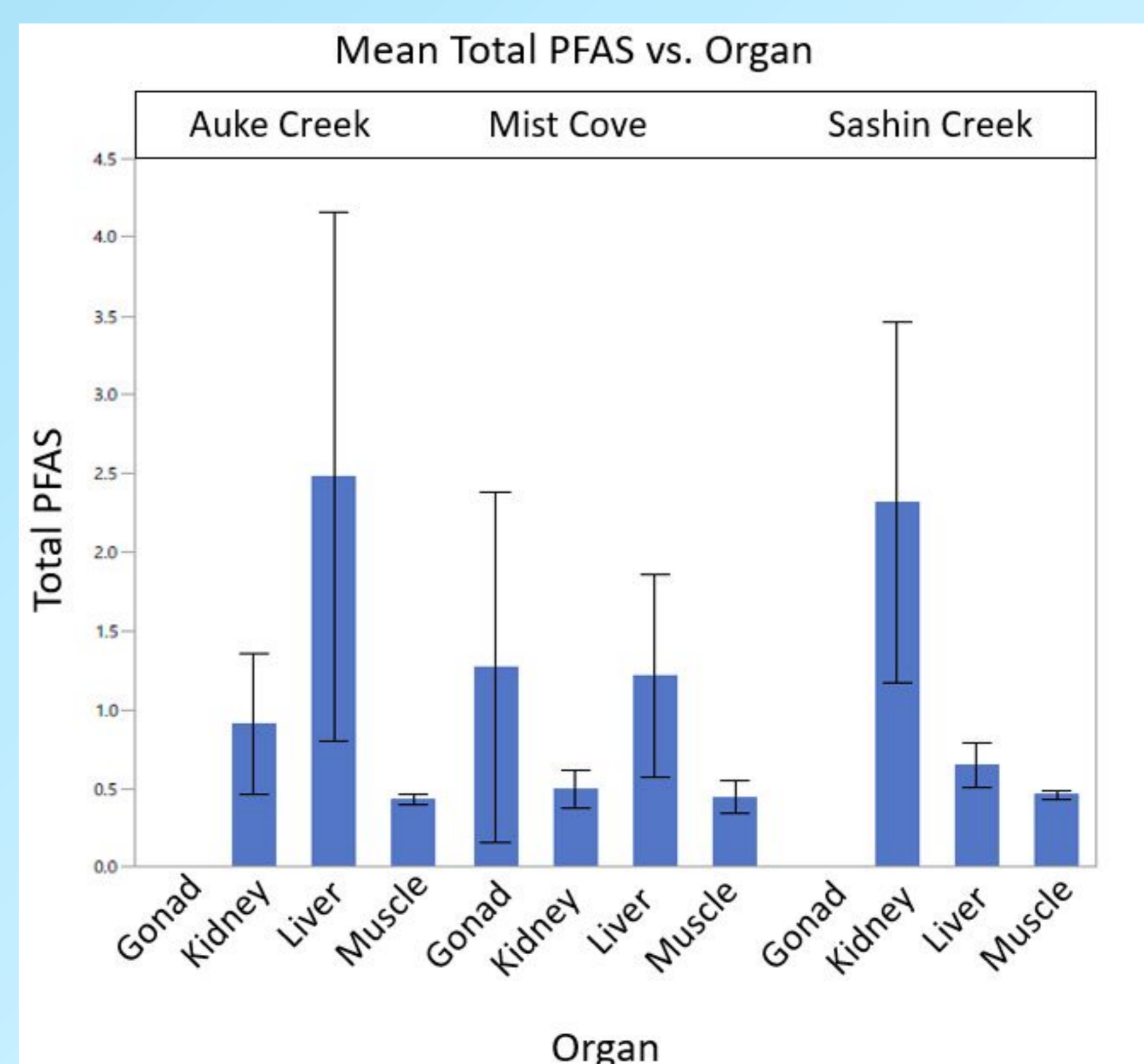
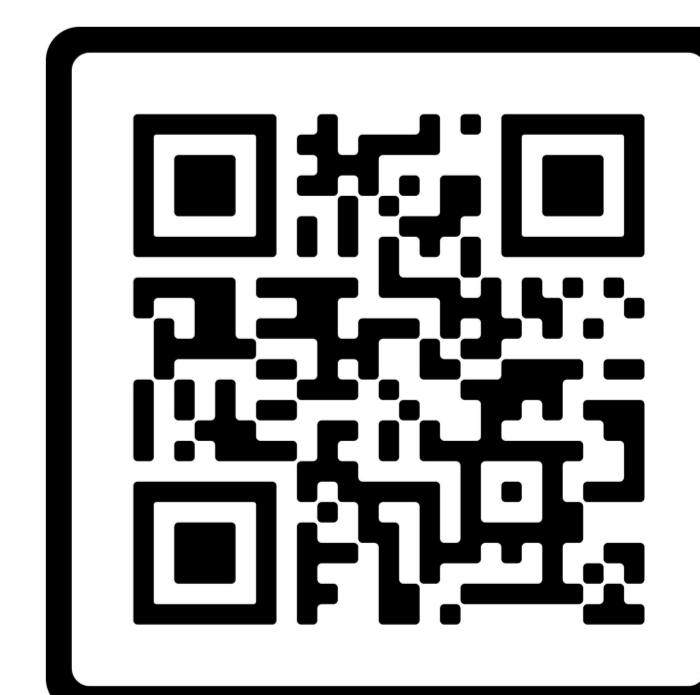


Figure 3. Concentration of total PFAS by organ in Year 2 for coho and pink salmon.

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