

# Fish Tissue Monitoring Program

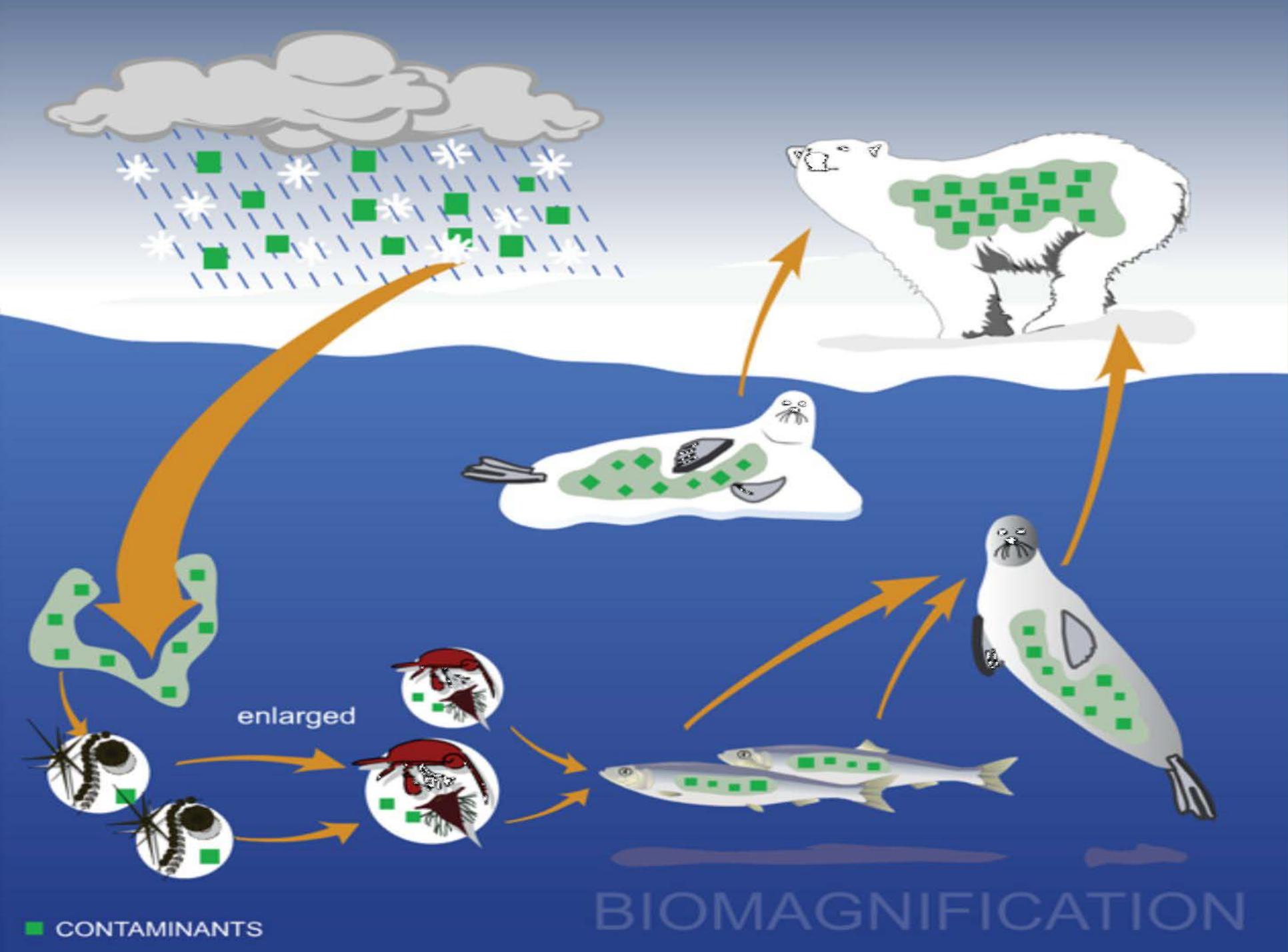
## Collaborative Effort:

ADEC, AKMAP, ADF&G, USFWS, USGS, NOAA, International Pacific Halibut Commission (IPHC), Commercial and Subsistence Fisherman



# Target Analytes

- Heavy Metals:
  - Mercury, Arsenic, Cadmium, Chromium, Nickel, Lead, Selenium
- Organochlorine Compounds:
  - PCBs
  - Dioxins and Furans
  - Pesticides
- Emerging Contaminants:
  - Brominated Fire Retardants (PBDE)
  - *Perfluorchemicals (PFC) PFOA, PFOS*
  - *Pharmaceuticals and Personal Care Products*
- Lipid Profiles:
  - *Omega 3 Fatty Acids*



enlarged

■ CONTAMINANTS

BIOMAGNIFICATION

# Fish Collection Procedures

- Basic technique:

- -Whole fish are collected (trawls, seine nets, hook and line)
- -Fish are killed and placed in a food grade plastic bag (fish sleeve)
- -Fish are placed on ice and shipped immediately; or frozen and shipped later

- Modified technique for Halibut:

- -Halibut are caught on longline
- -Length measurements are used to calculate weight, otoliths are removed for aging
- -3 to 5 pound section of fillet will be removed from directly behind the gill plate and processed the same as a whole fish sample

- Dockside or Creel Survey:

- -Portion of the fillet is collected in a food grade plastic bag
- - Analyzed for Total Mercury

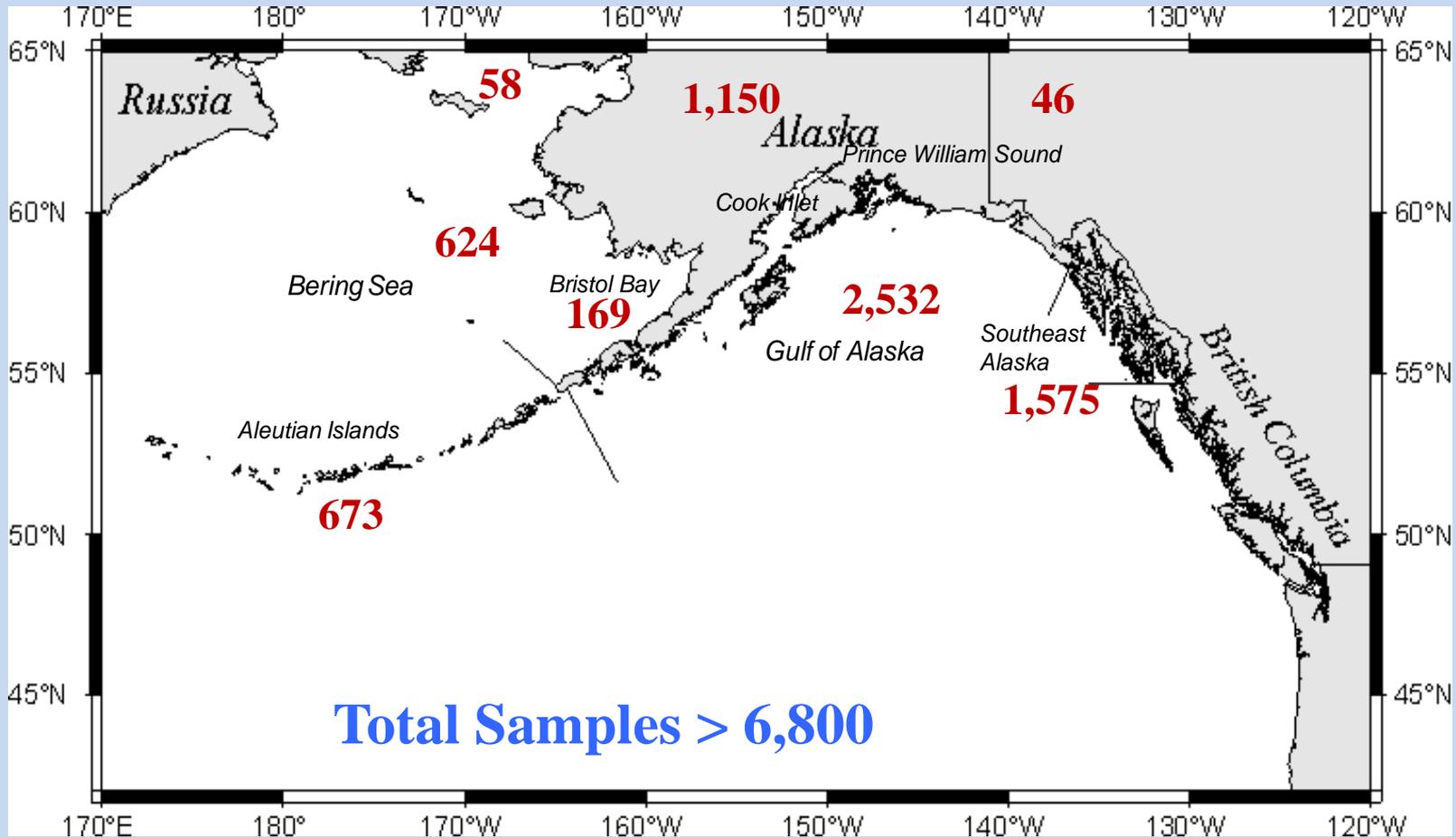
# Sampling Plan

- General Survey of Alaskan Fishes-
  - Commercial , Subsistence, Recreational species
  - Opportunistic sampling
  - Site specific sampling
- Sampling plan for each species will be further refined after review of the initial data
  - Evaluate concentration of contaminant
  - Evaluate variability of data
- Sampling Plan developed for Halibut with guidance from the IPhC biometricians

# Species of Alaskan Fishes

<b>Arctic Cod</b>	<b>Lingcod</b>	<b>Salmon Chinook</b>
<b>Atka Mackerel</b>	<b>Northern Pike</b>	<b>Salmon Chum</b>
<b>Black Rockfish</b>	<b>Octopus</b>	<b>Salmon Coho</b>
<b>Burbot</b>	<b>Pacific Cod</b>	<b>Salmon Pink</b>
<b>Capelin</b>	<b>Pacific Ocean Perch</b>	<b>Salmon Sockeye</b>
<b>Cisco</b>	<b>Pollock</b>	<b>Sand Lance</b>
<b>Dolly Varden</b>	<b>Rockfish- Silvergray</b>	<b>Shark</b>
<b>Eulachon</b>	<b>Rockfish-Dusky</b>	<b>Shark-Spiny Dogfish</b>
<b>Grayling</b>	<b>Rockfish-Quillback</b>	<b>Sheefish</b>
<b>Greenling</b>	<b>Rockfish-Yelloweye</b>	<b>Shellfish</b>
<b>Halibut</b>	<b>Rougheye Rockfish</b>	<b>Sole</b>
<b>Herring</b>	<b>Sablefish</b>	<b>Trout Lake</b>
<b>Lamprey</b>	<b>Saffron Cod</b>	<b>Trout Rainbow</b>

# Distribution of Fish Samples Collected for the Fish Monitoring Program



## Number of Fish Samples per Region



# Sources of Environmental Contaminants

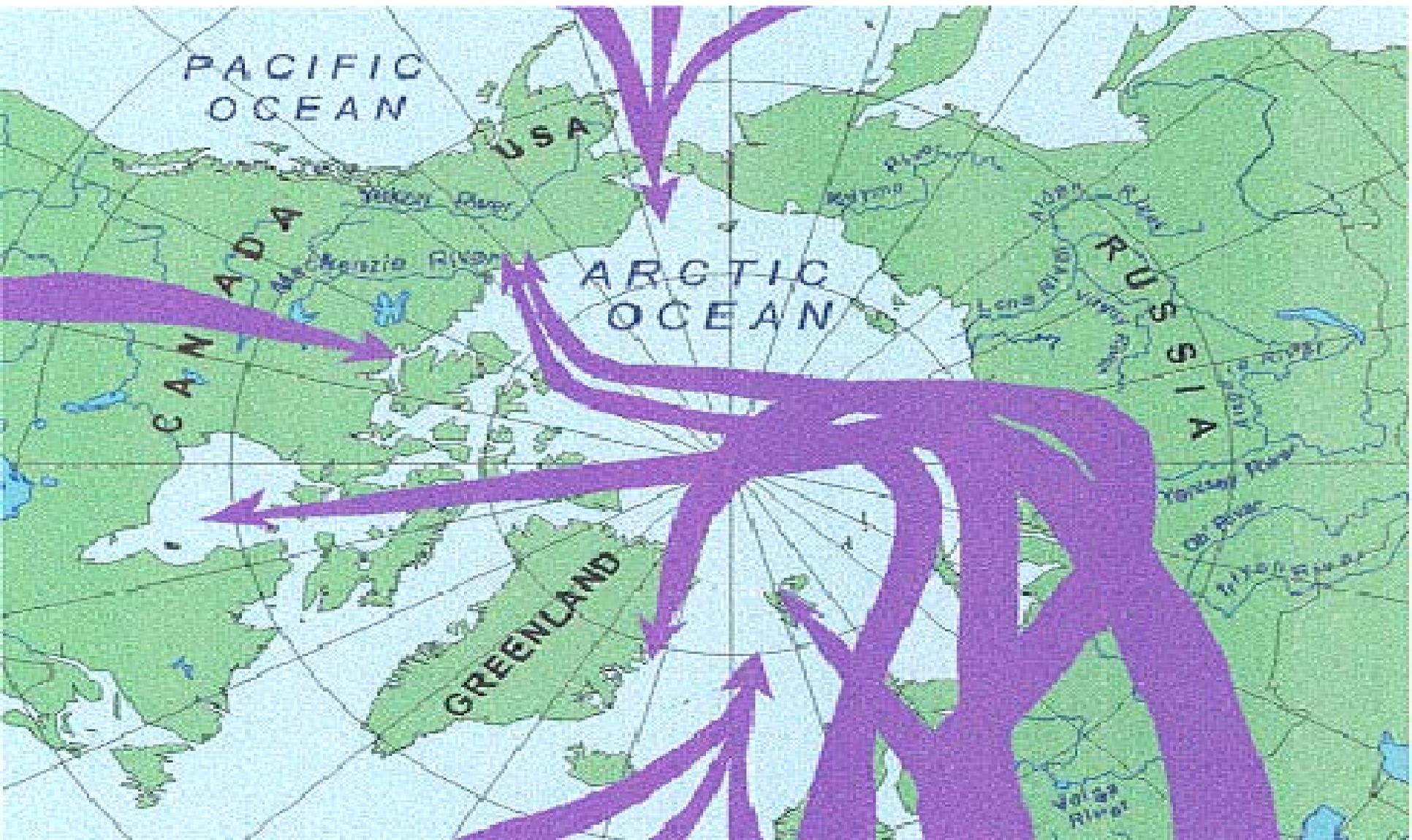
- **Local**

- Natural Geologic sources: mineral deposits, volcanoes
- Forest fires
- Anthropogenic Sources
  - Industrial production
  - Military Sites
  - Resource Extraction

- **Long Range Transport**

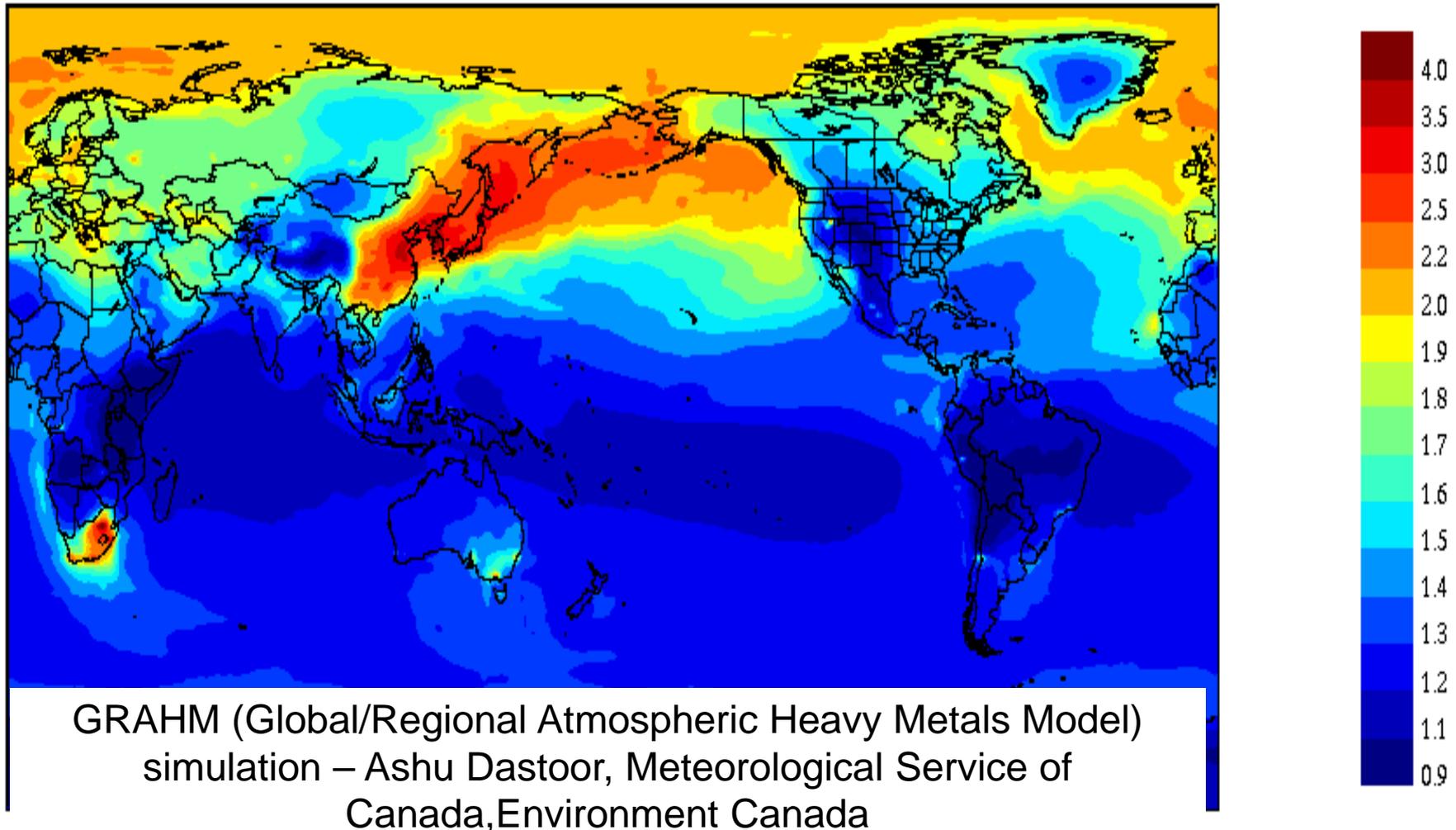
- Atmospheric
- Ocean Currents
- Animal migration
- Commercial transport

# Air Transport Pathways

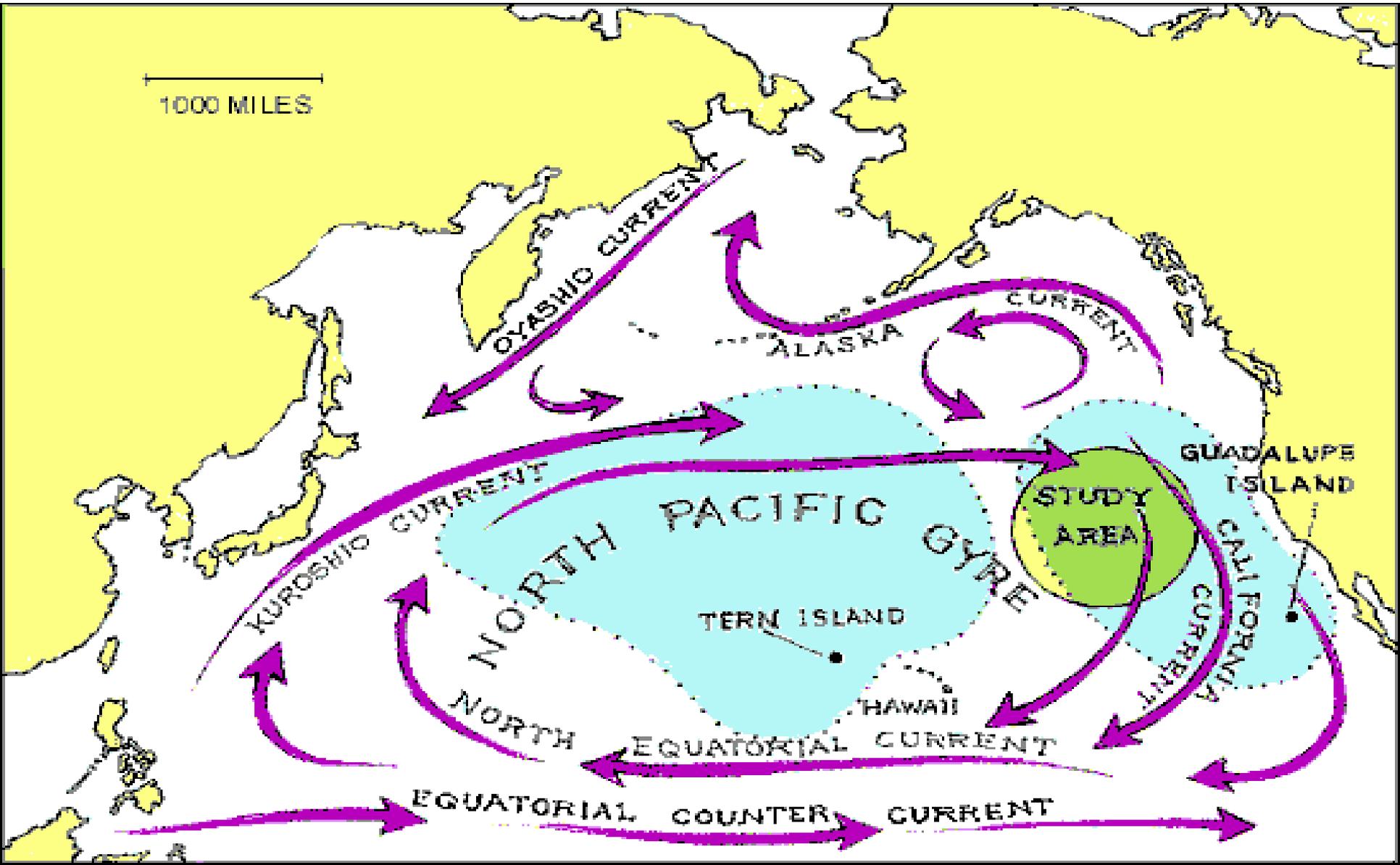


# Global transport modelling

Average elemental mercury surface concentrations for July 2001 (ng/m<sup>3</sup>)



# North Pacific Gyre



# Fish Tissue Monitoring Program

## Summary of Data:

Mercury

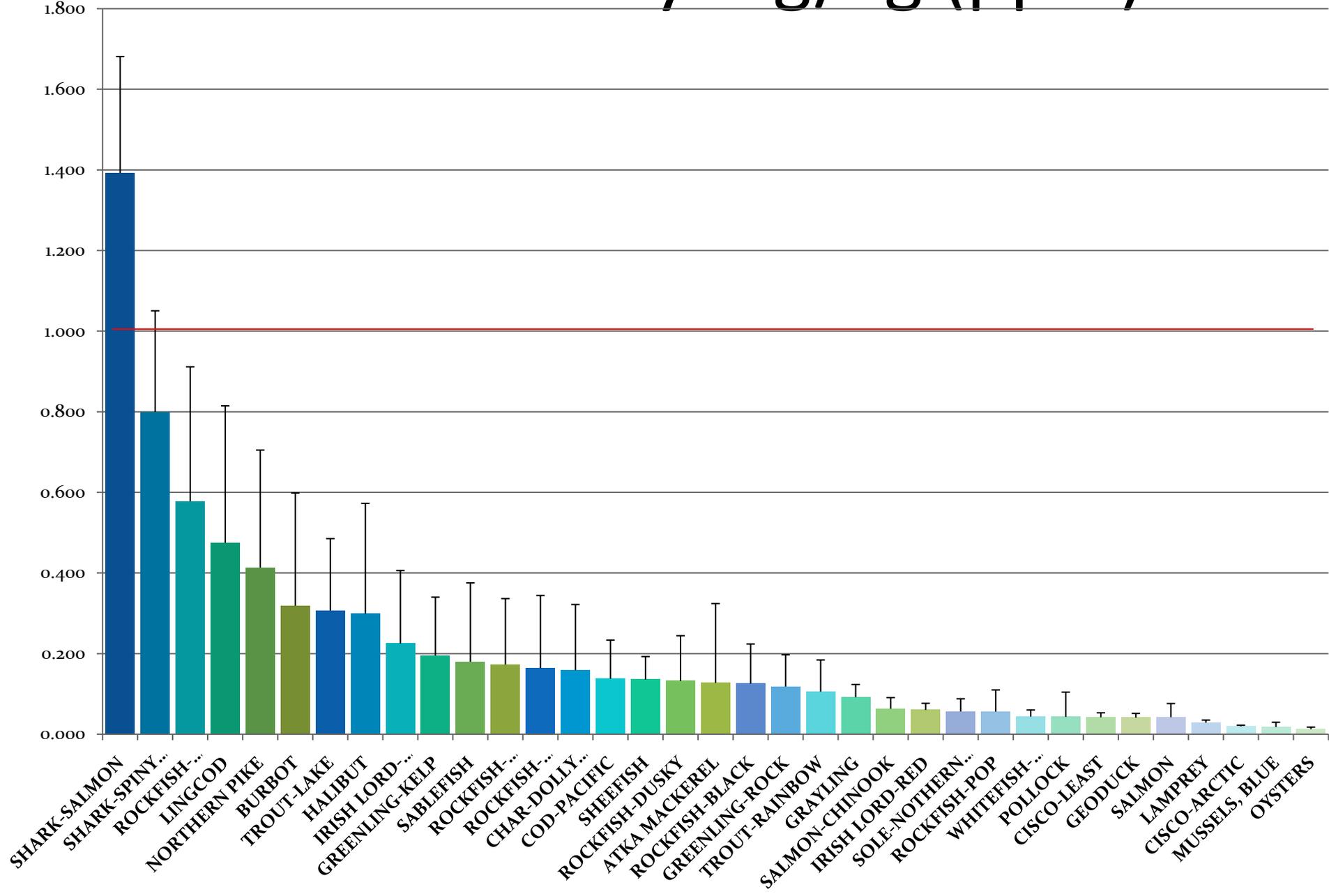
PCBs

Pesticides

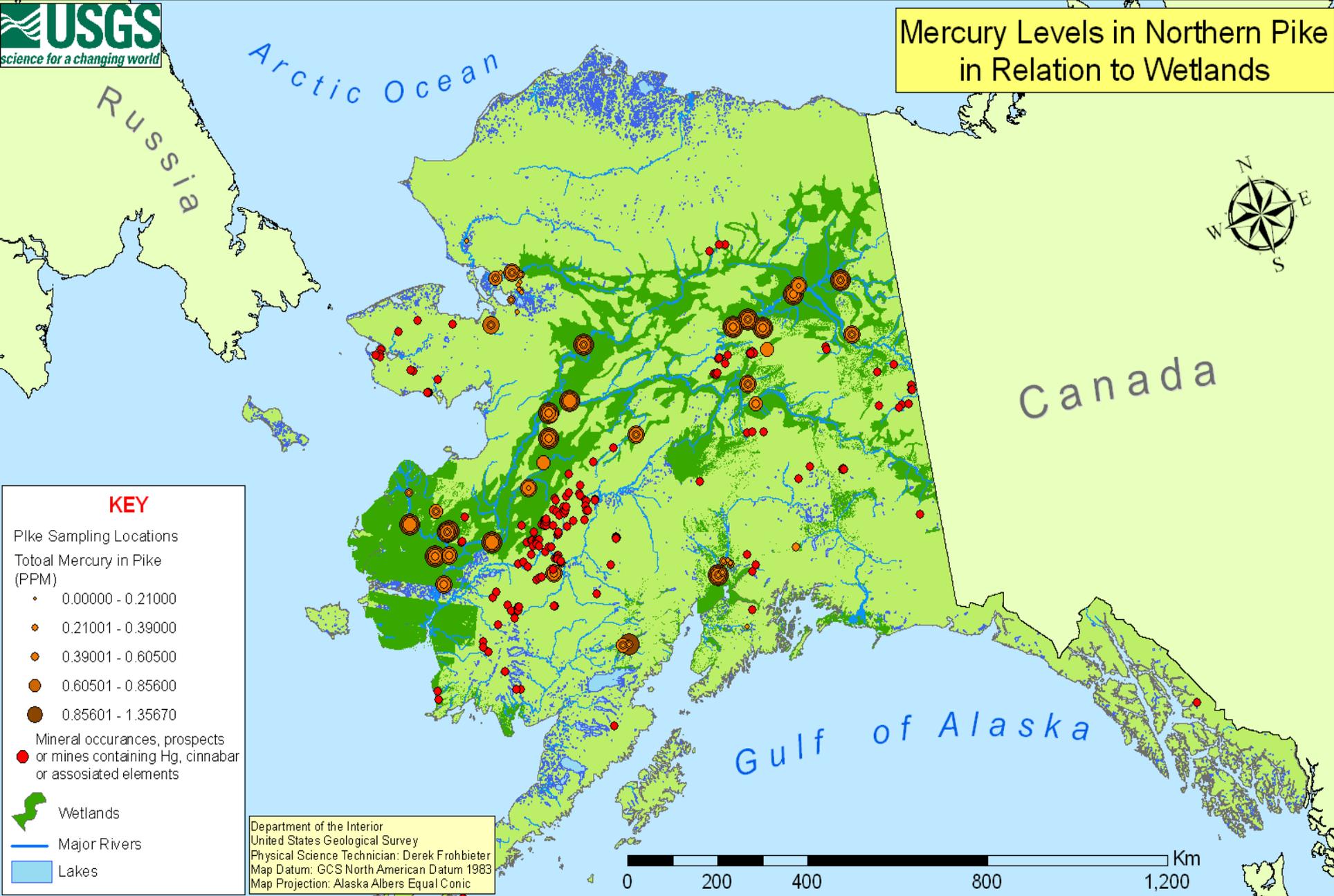
PBDEs

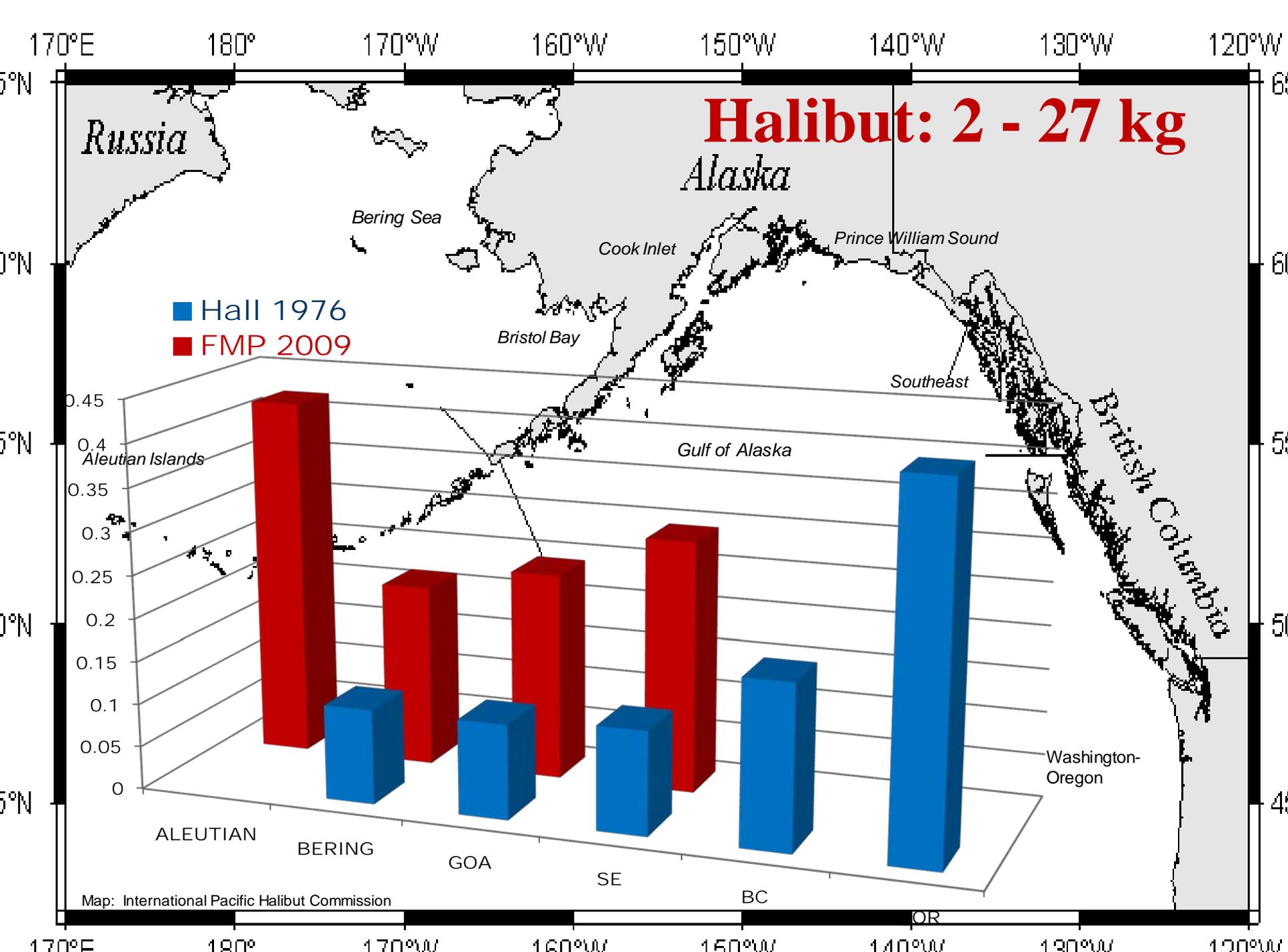


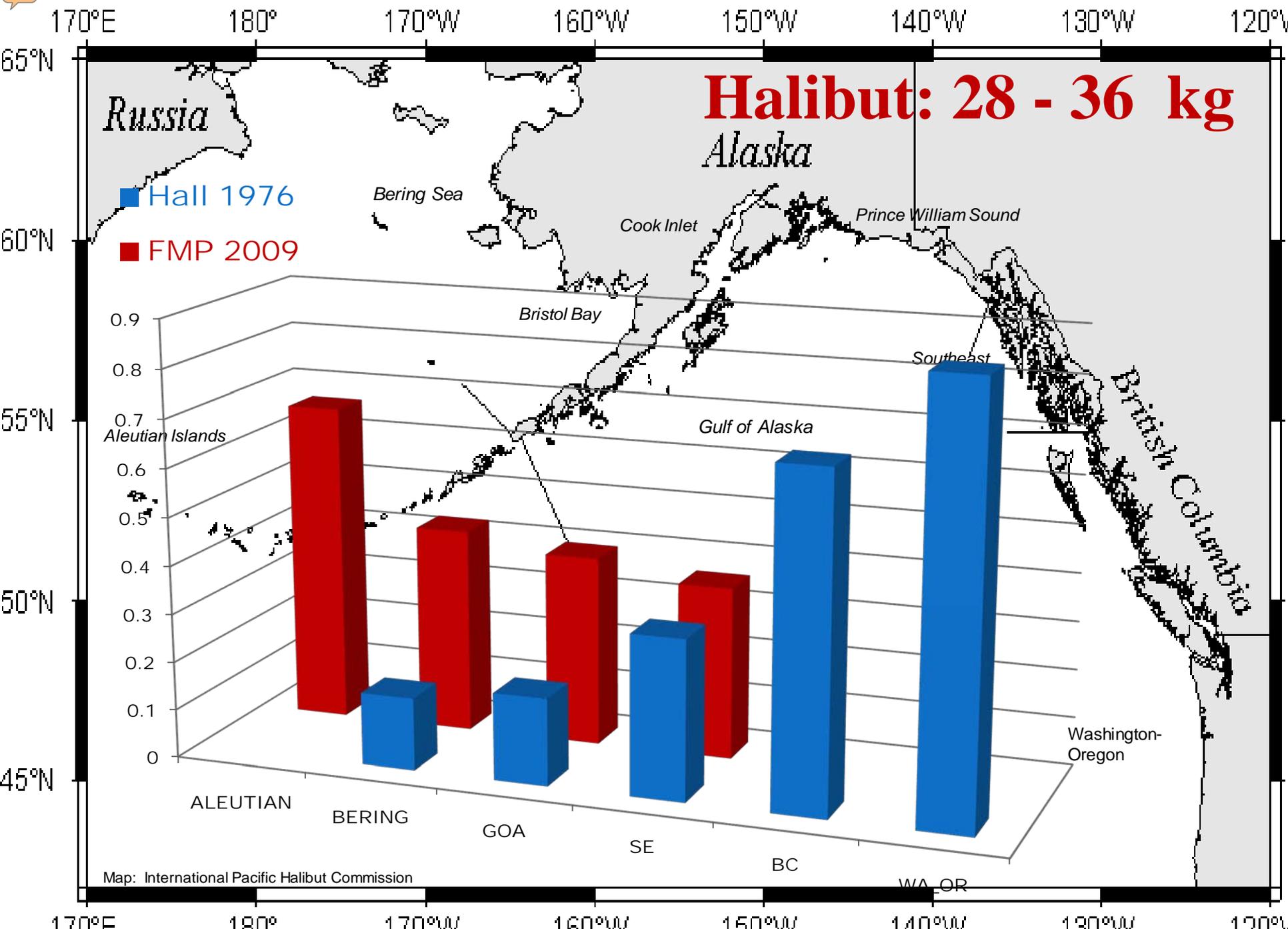
# Total Mercury mg/kg (ppm)



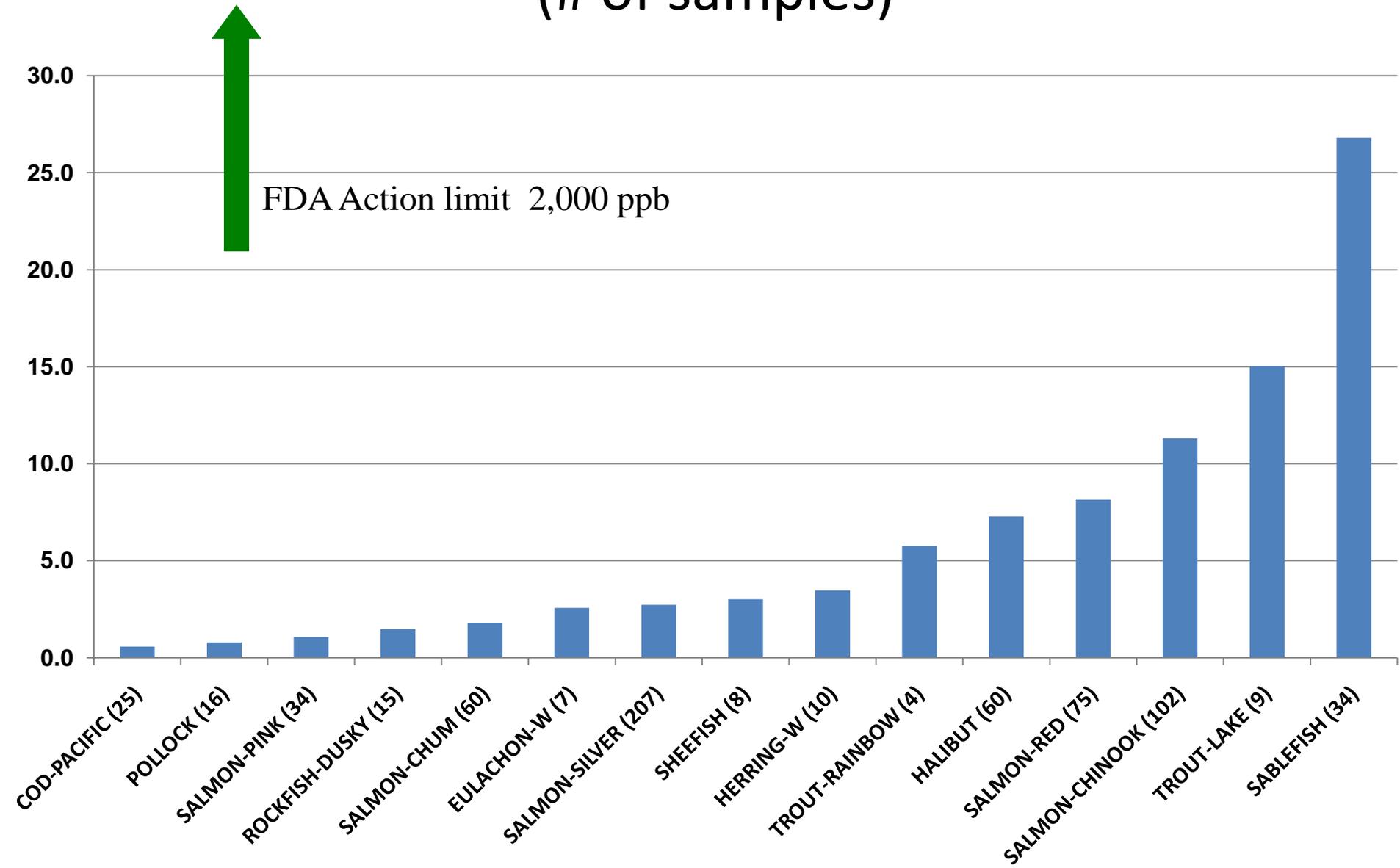
# Mercury Levels in Northern Pike in Relation to Wetlands



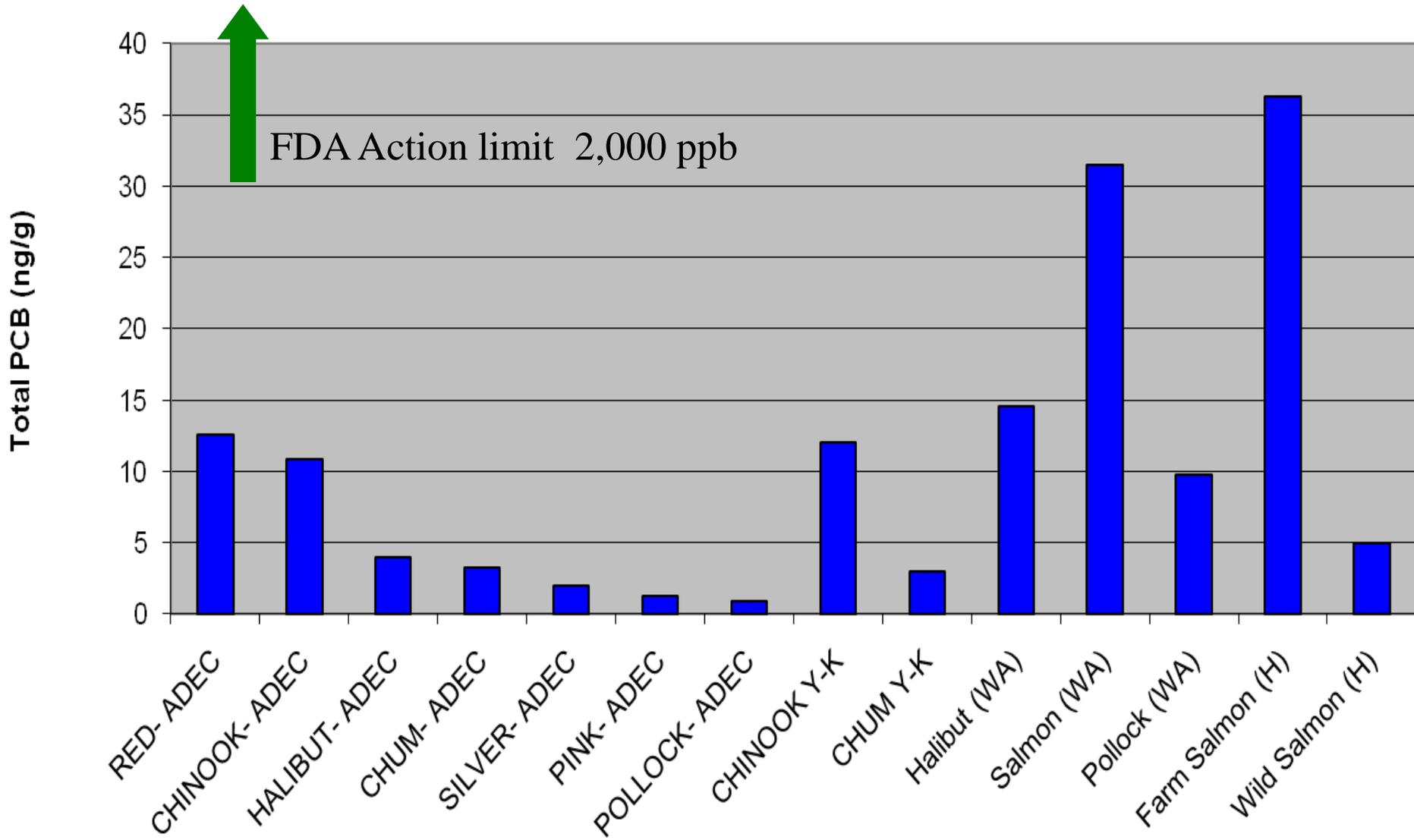




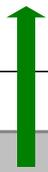
# Total PCBs ppb (ng/g) Alaskan Fish (# of samples)



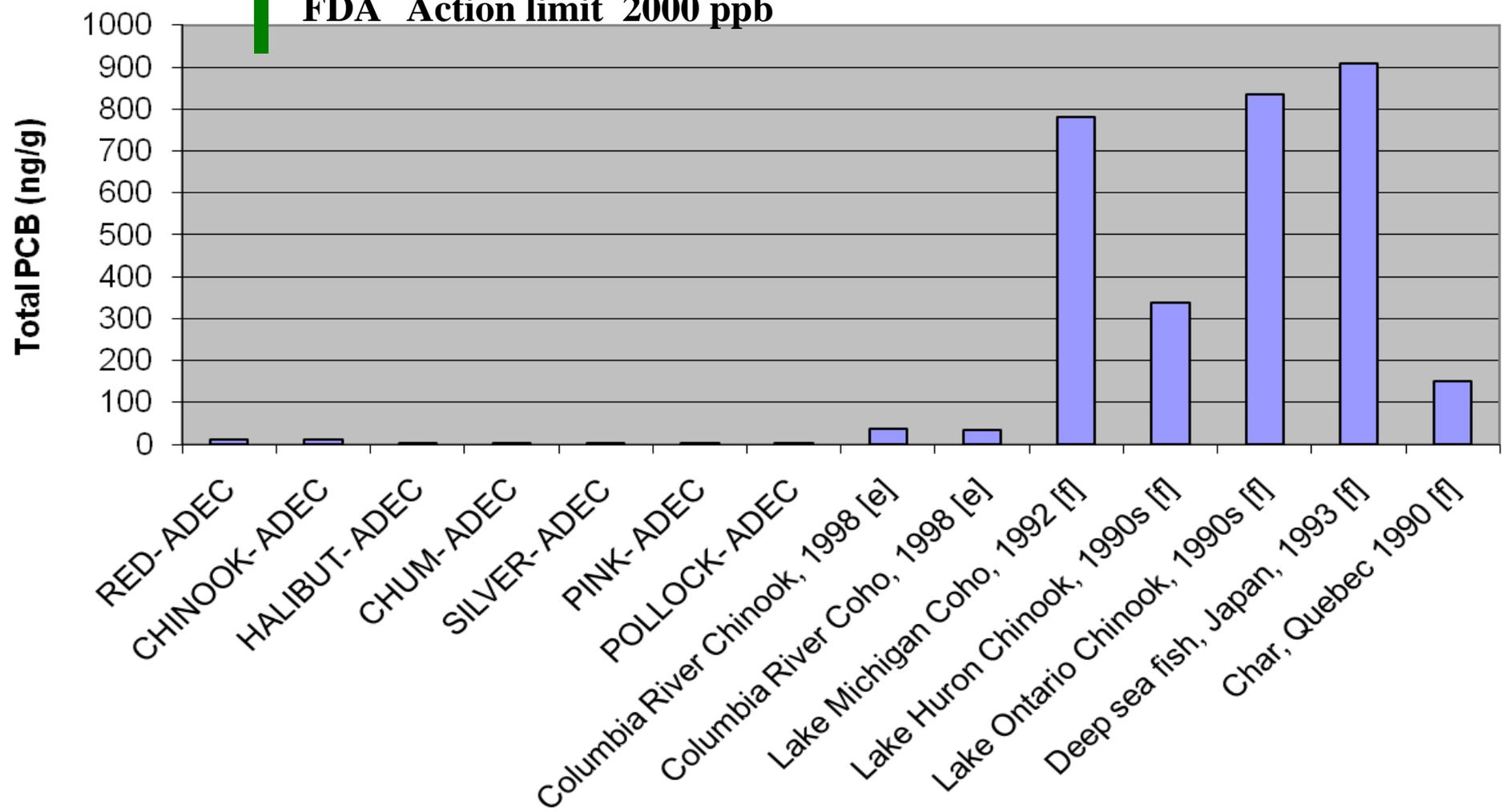
# Comparison PCB Concentration



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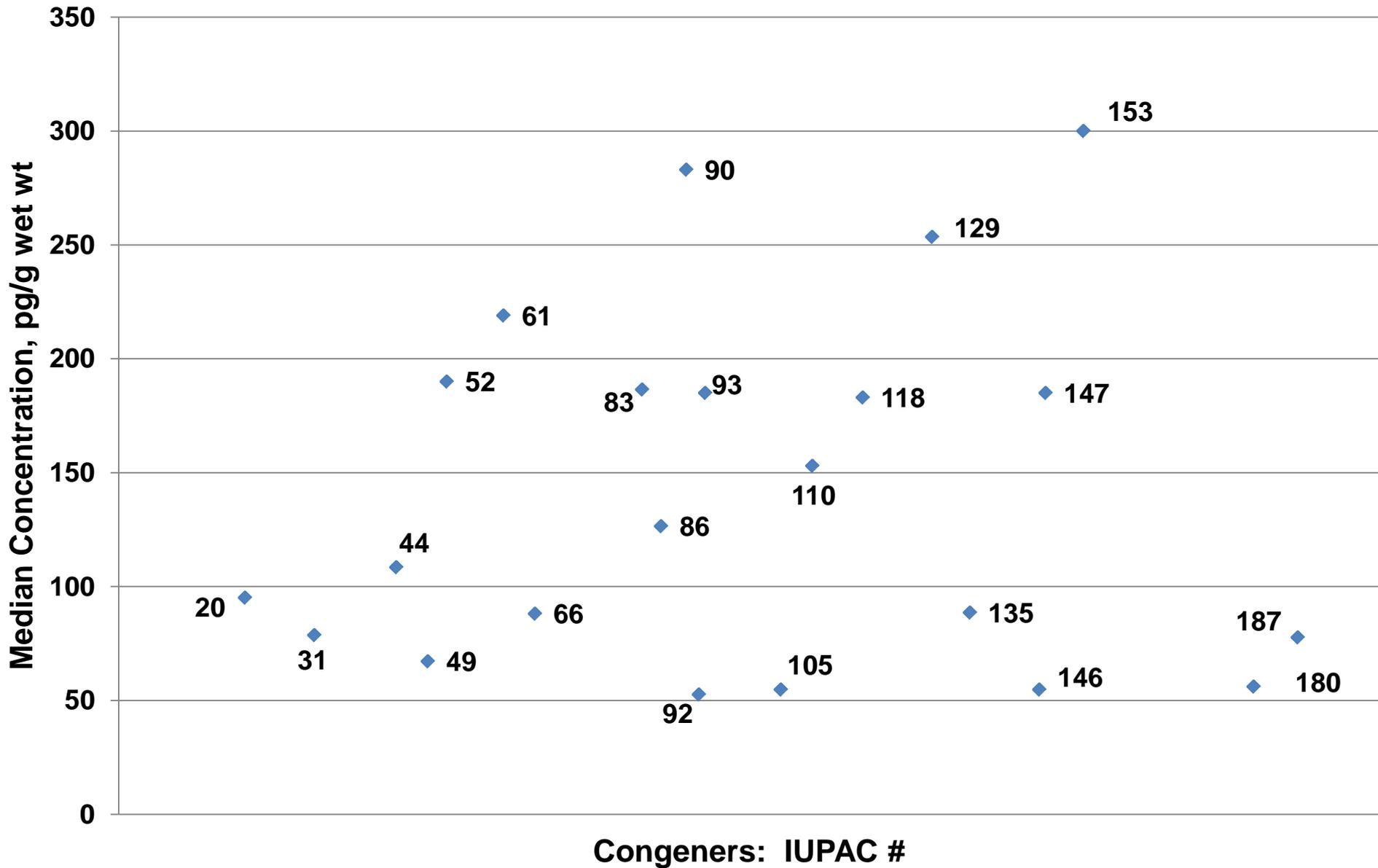


**FDA Action limit 2000 ppb**

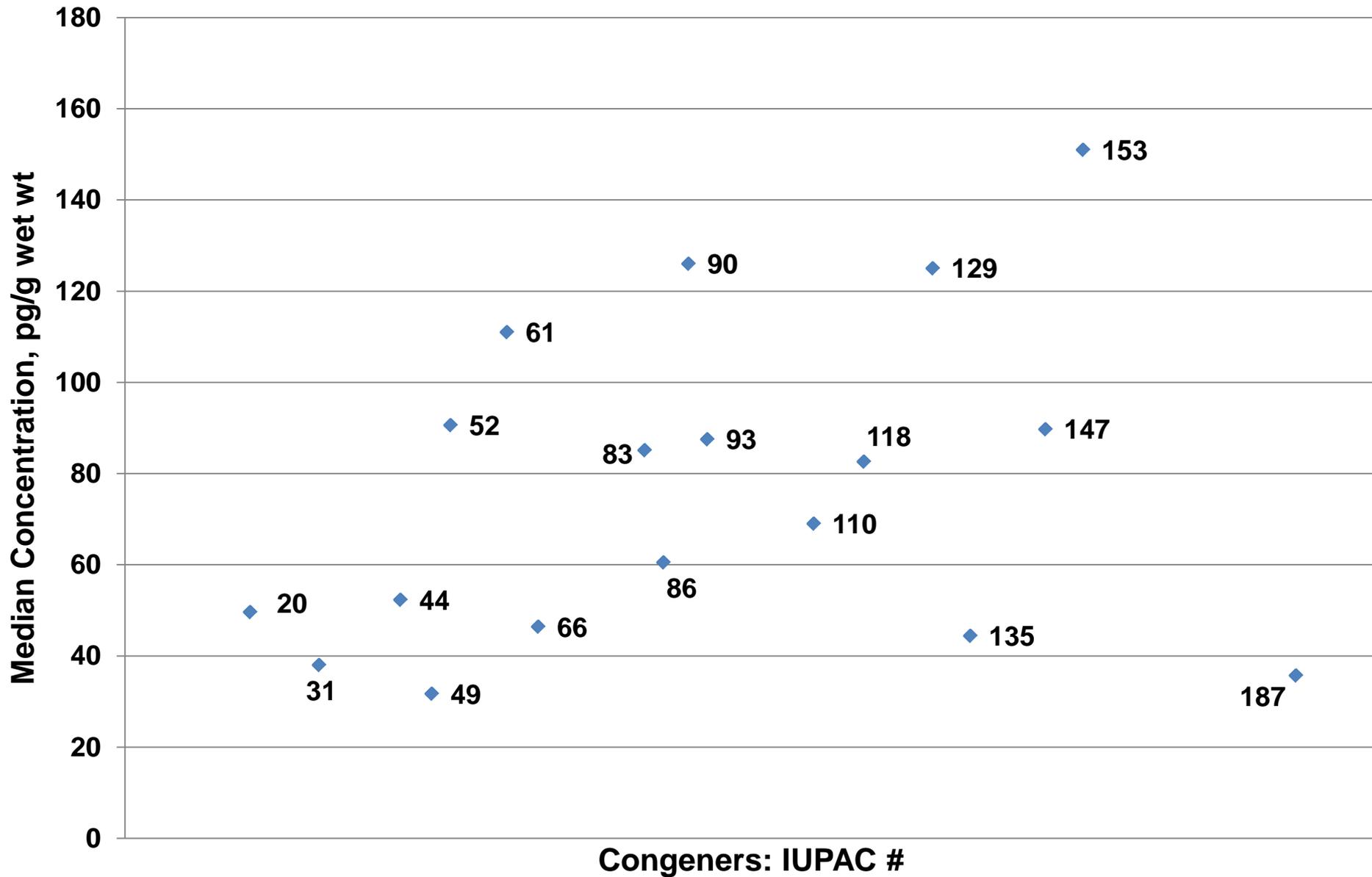




# PCB Congener Pattern: Whole Salmon

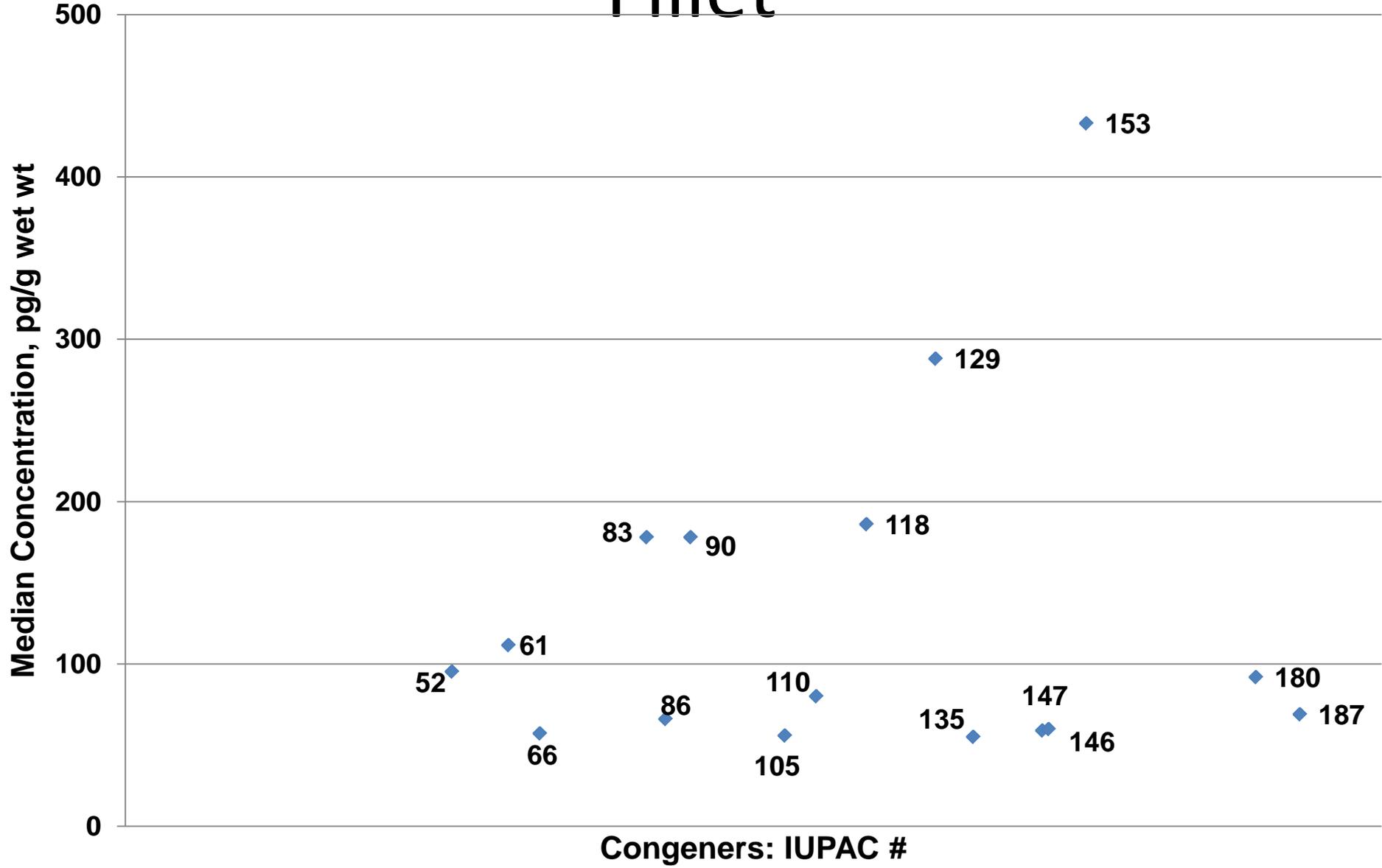


# PCB Congener Pattern: Salmon Fillet



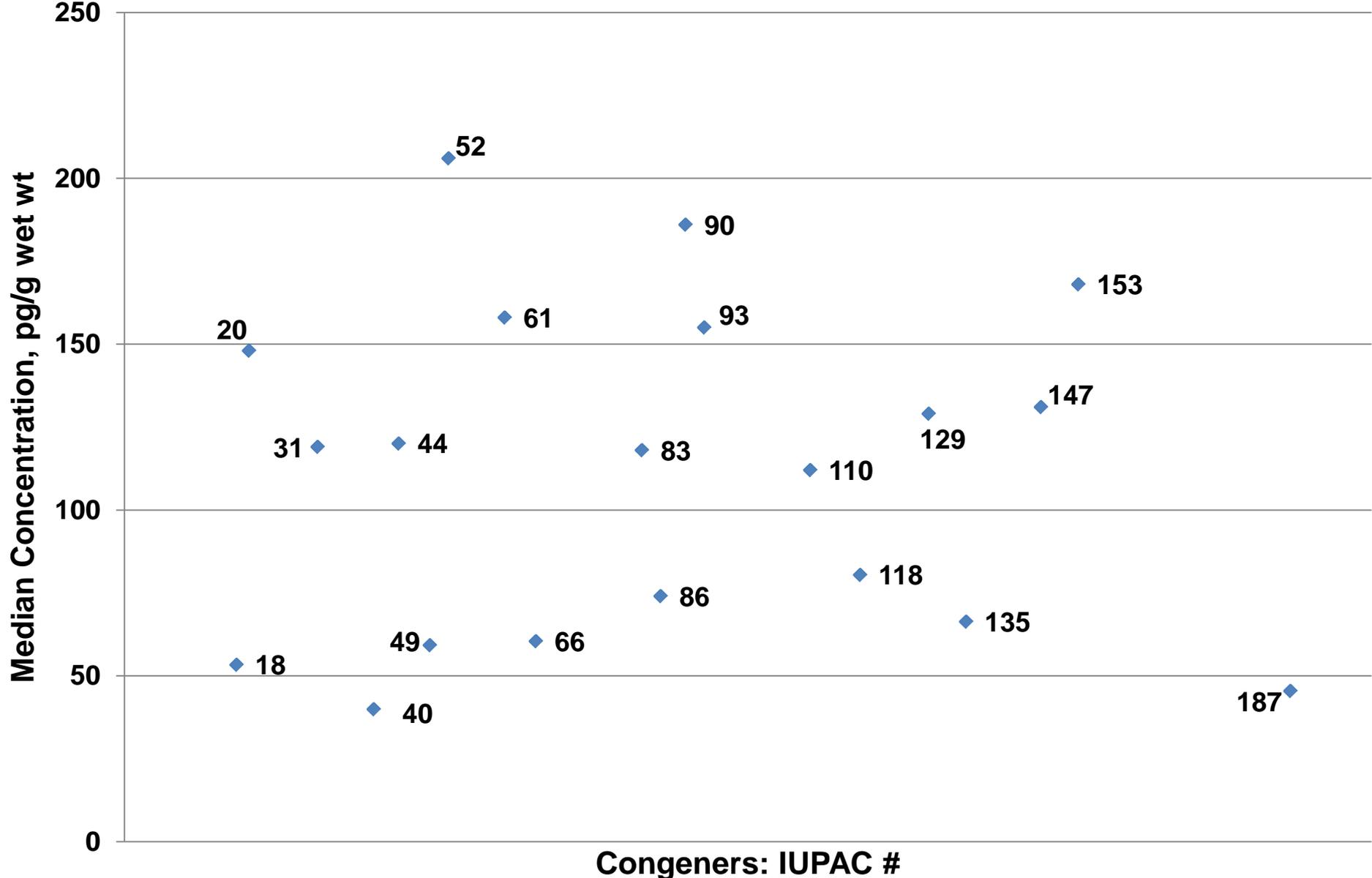


# PBC Congener Pattern: Groundfish Fillet

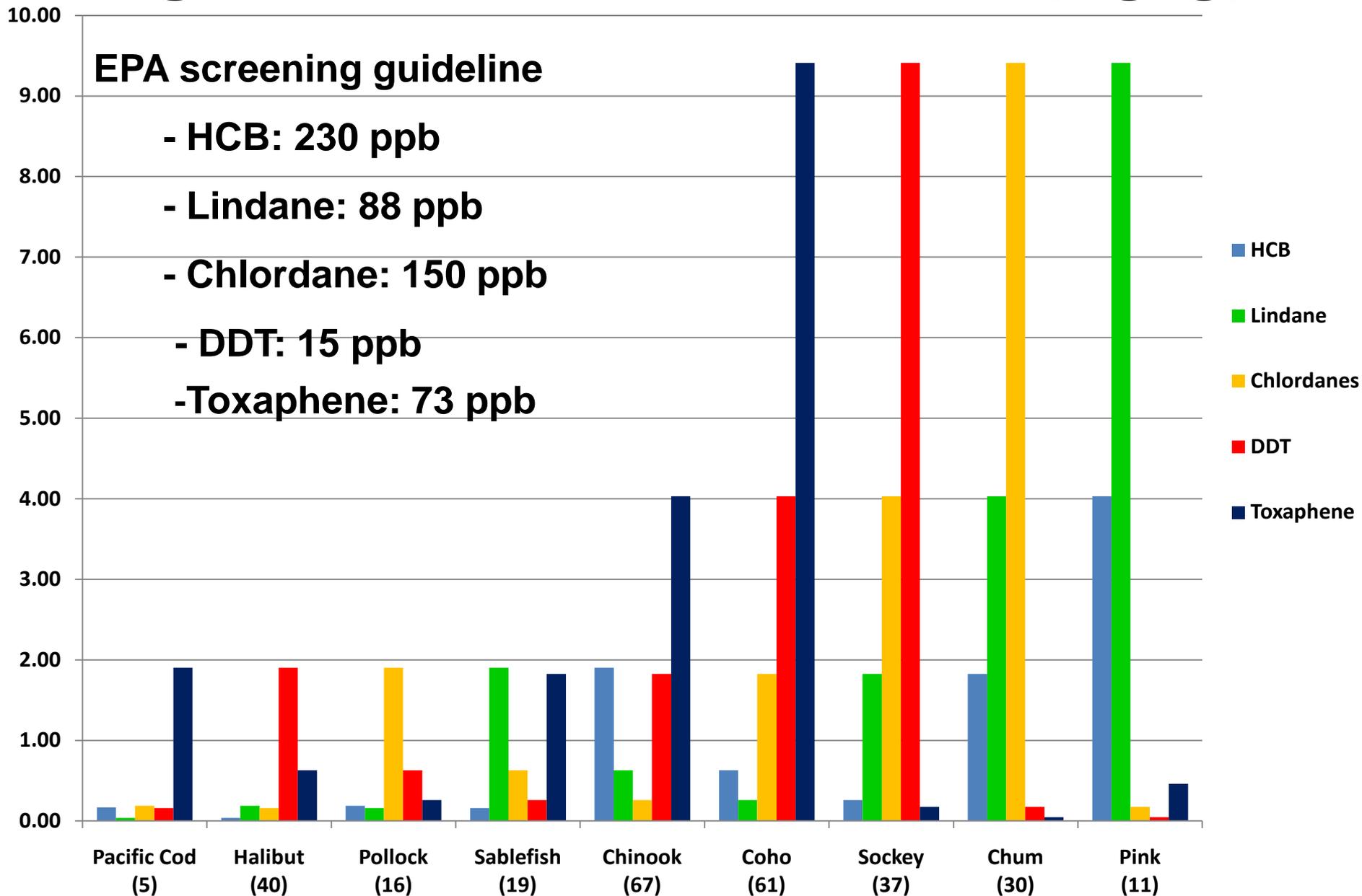




# PCB Congener Pattern: Forage Fish



# Organo-Chlorine Pesticides (ng/g)



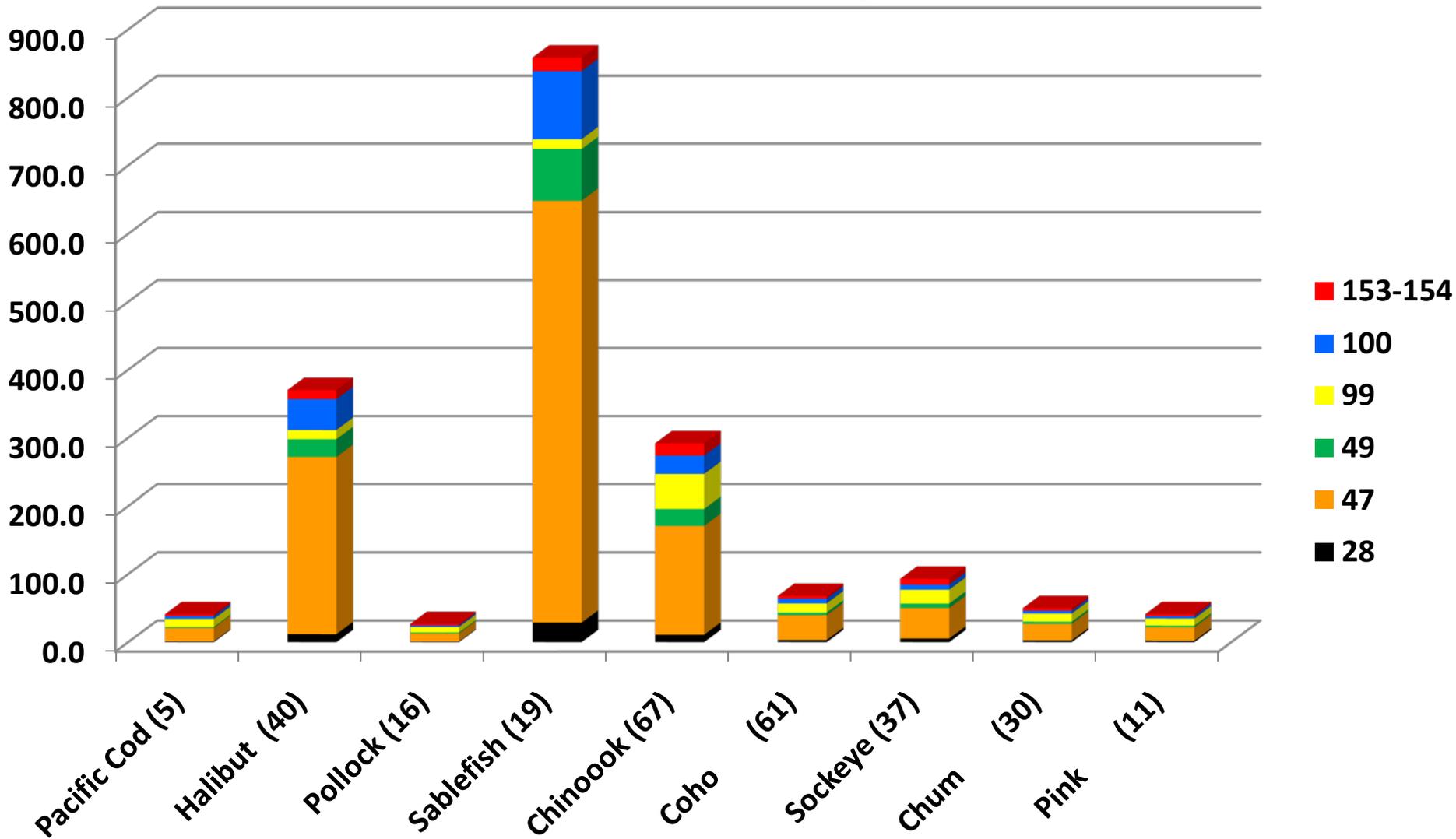


# PBDEs in PNW Fishes

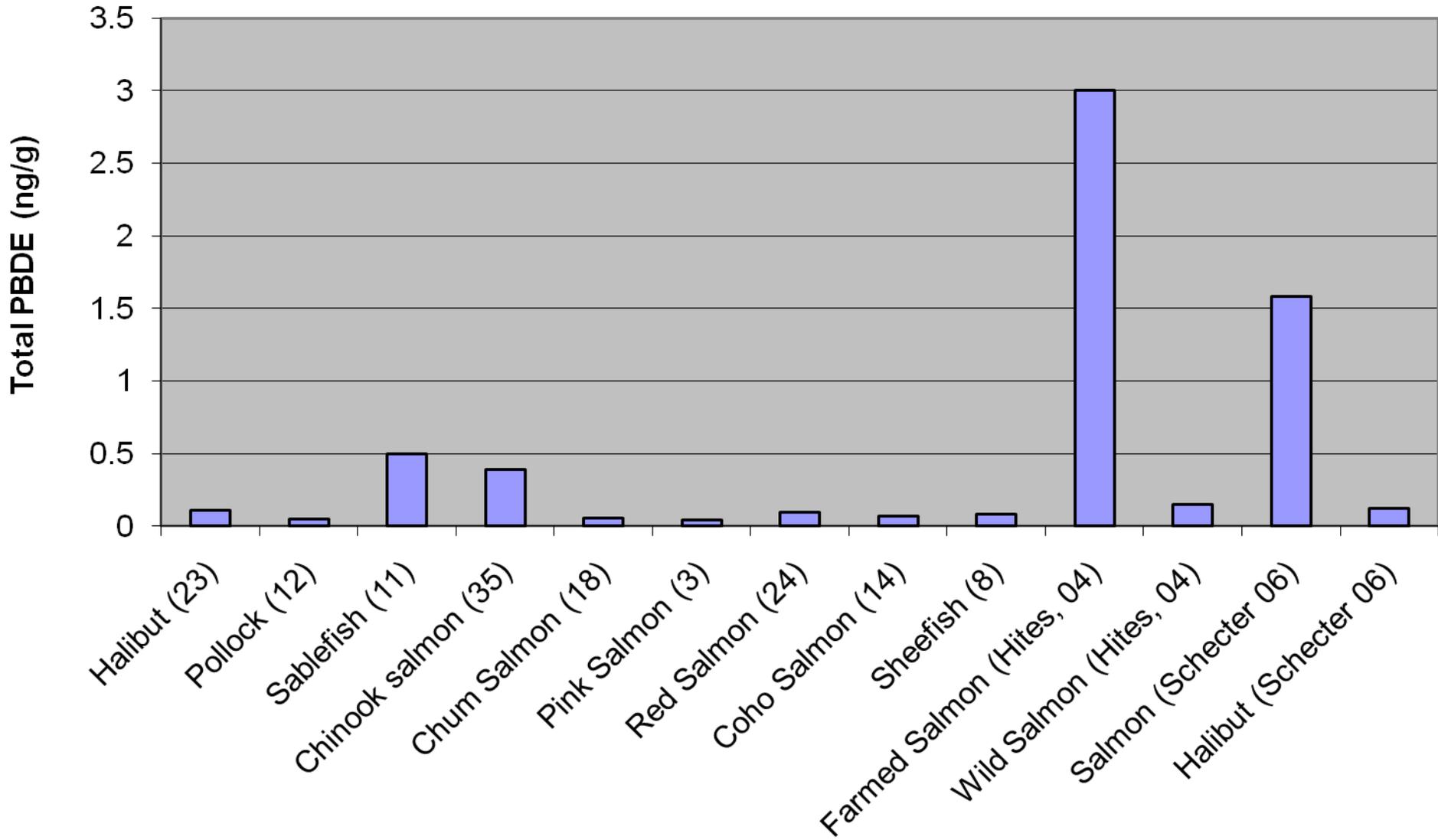
- PBDE Predominant Congeners:  
28,47,49,99,100,154
- Concentrations similar to other data from AK fish (Hites, Yougui, Easton)
- Trend shows declining concentrations ?
  - Non-statistical decline 2002 to 2008
- Southeasterly increase in PBDE concentrations
- Further details in Environmental Toxicology & Chemistry, June 2011, by Ikonomou, et.al.

# Total PBDE ppt (pg/g)

## Relative Congener



# Comparison Total PBDEs (ppb)



# Overview

- The ADPH has reviewed data from the Fish Monitoring Program
- POPs contaminant levels are very low
- Mercury levels are very low in most fish species, especially salmon
- Mercury levels are higher in a few fish species.
  - **New consumption guidance published**
- ADPH strongly encourages sustained or increased fish consumption due to important health benefits!



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