



Alaska Department of Environmental Conservation
Office of the State Veterinarian Fish Monitoring Program
5251 Dr. Martin Luther King Jr. Ave.
Anchorage, AK 99508
(907) 375-8200

ANALYTICAL RESULTS FOR TRACE ELEMENTS IN FISH TISSUE SAMPLES

Analytical Analysis performed by:
Alaska State Environmental Health Laboratory
5251 Dr. Martin Luther King Jr. Avenue
Anchorage, AK 99507
<http://dec.alaska.gov/eh/lab>

Summary report prepared by:

Christoff Furin, PhD
Research Analyst III
Department of Environmental Conservation
Office of the State Veterinarian
christoff.furin@alaska.gov
(907) 375-8211

Report to:

Sample Location(s):

Analytes: As, Cd, Cu, Pb, Hg, Se

Date of Report: April 10, 2024

Narrative:

SAMPLES AND ANALYSIS:

Samples were received at the State Environmental Health Lab (EHL). They were stored at -20°C and processed according to standard operation procedures (SOP) of the Fish Monitoring Program and EHL. Analytical analysis of total mercury in the fish tissue samples was performed according to EPA Method 7473 using a DMA-80 (Direct Mercury Analyzer). Arsenic, copper, selenium, cadmium and lead were analyzed using ICP/MS by EPA method 6020 after microwave assisted acid digestion (EPA 3051A). Analytical analysis of methylmercury in the fish tissue samples was performed using high performance liquid chromatography-inductively coupled plasma-mass spectrometry (HPLC-ICP-MS) using a modified method developed for seafood by the FDA. Standard EHL QA/QC procedures were followed.

RESULTS:

A spreadsheet with the analytical data is provided with this report. A table of summary statistics is provided below. Results are reported in mg/Kg (parts per million) wet weight. If you would like a copy of the full analytical report send a request to C. Furin. See our website: <http://dec.alaska.gov/eh/vet/fish-monitoring-program> for further information about contaminants in fish and shellfish from the State of Alaska. Fish consumption guidelines for Alaska can be found at <http://dhss.alaska.gov/dph/Epi/eph/Pages/fish/default.aspx>

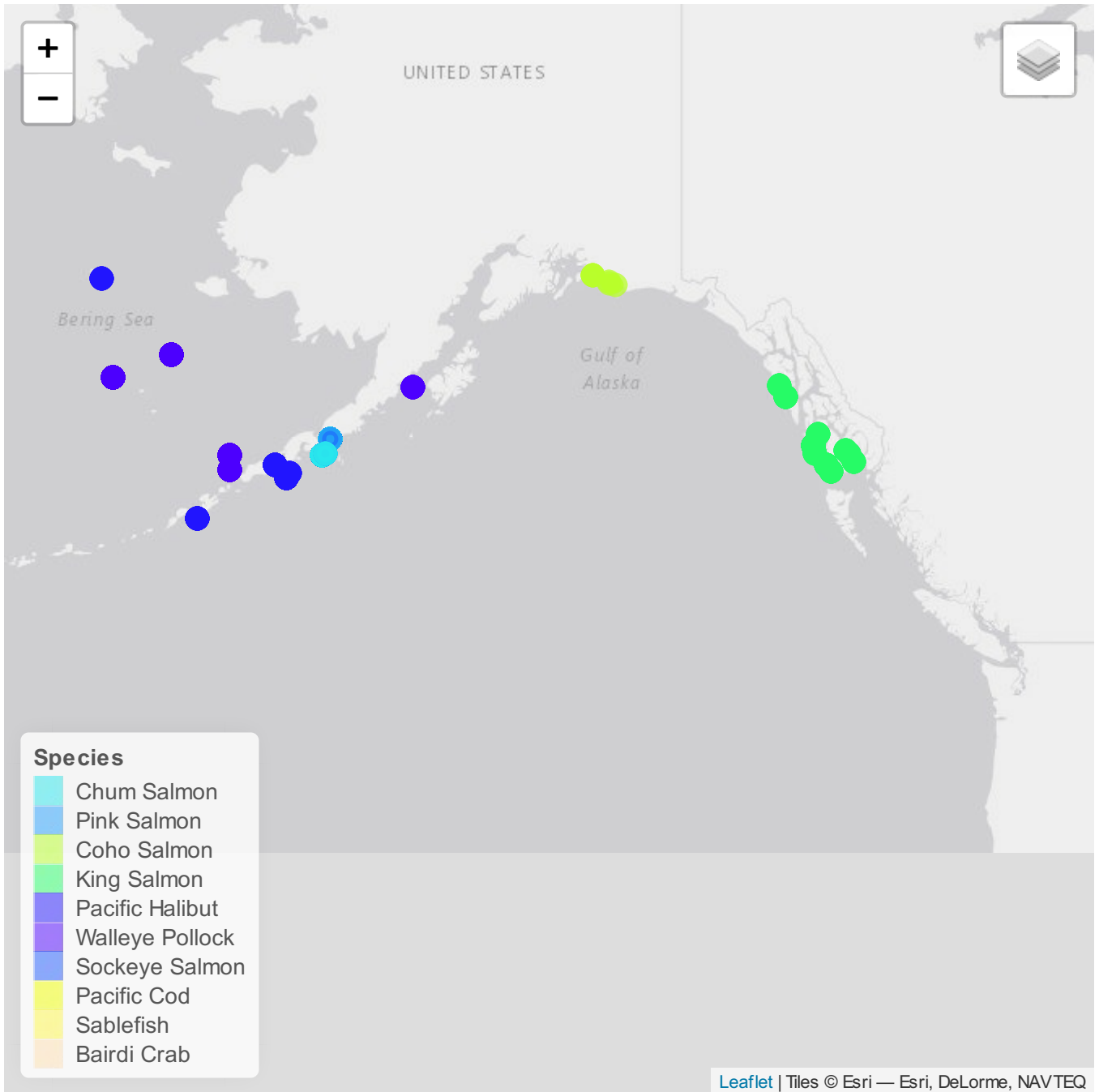


Figure 1: Sample Locations

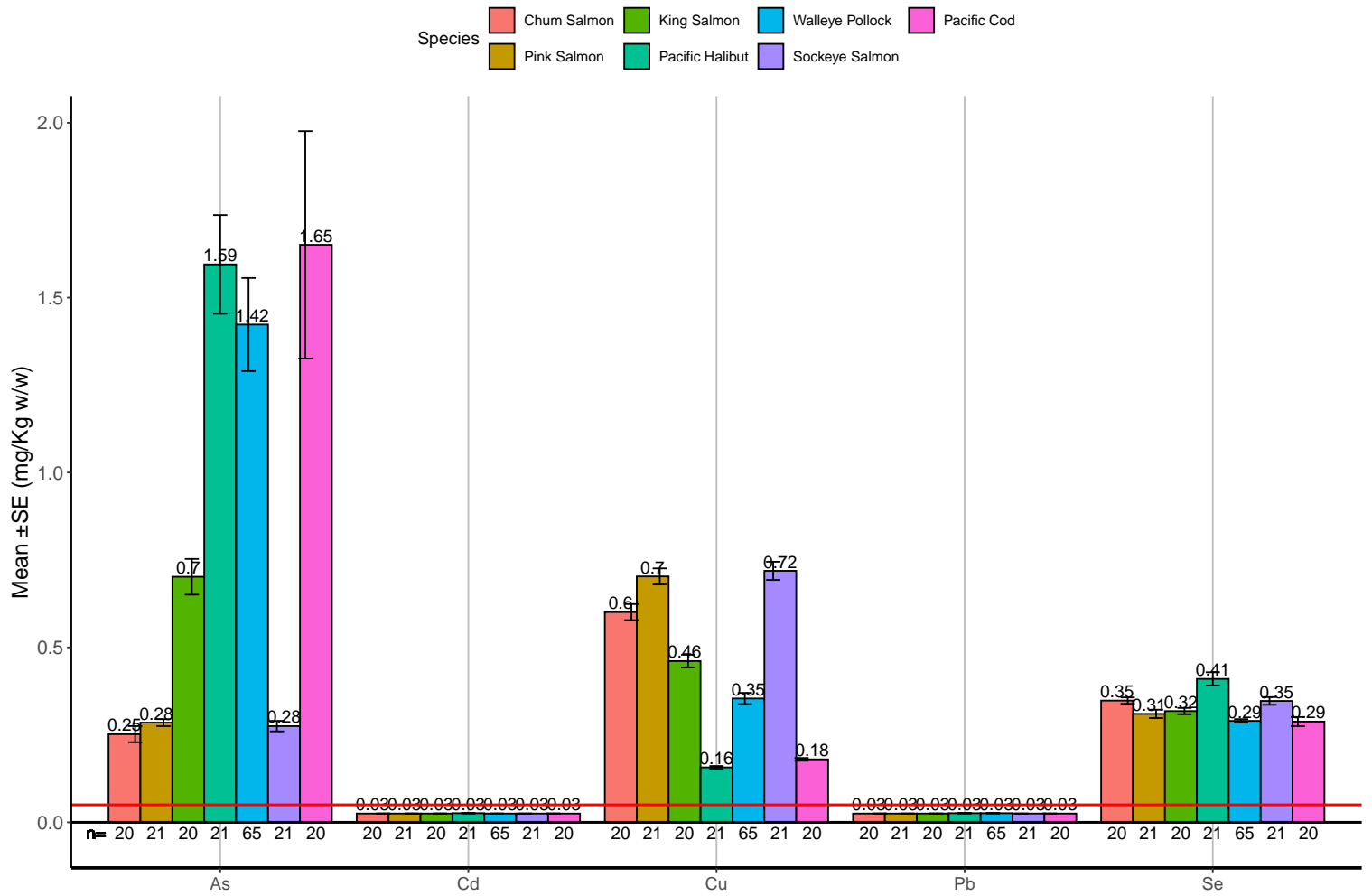


Figure 2: Heavy Metals in Fish Submitted. Red line indicates the reporting limit

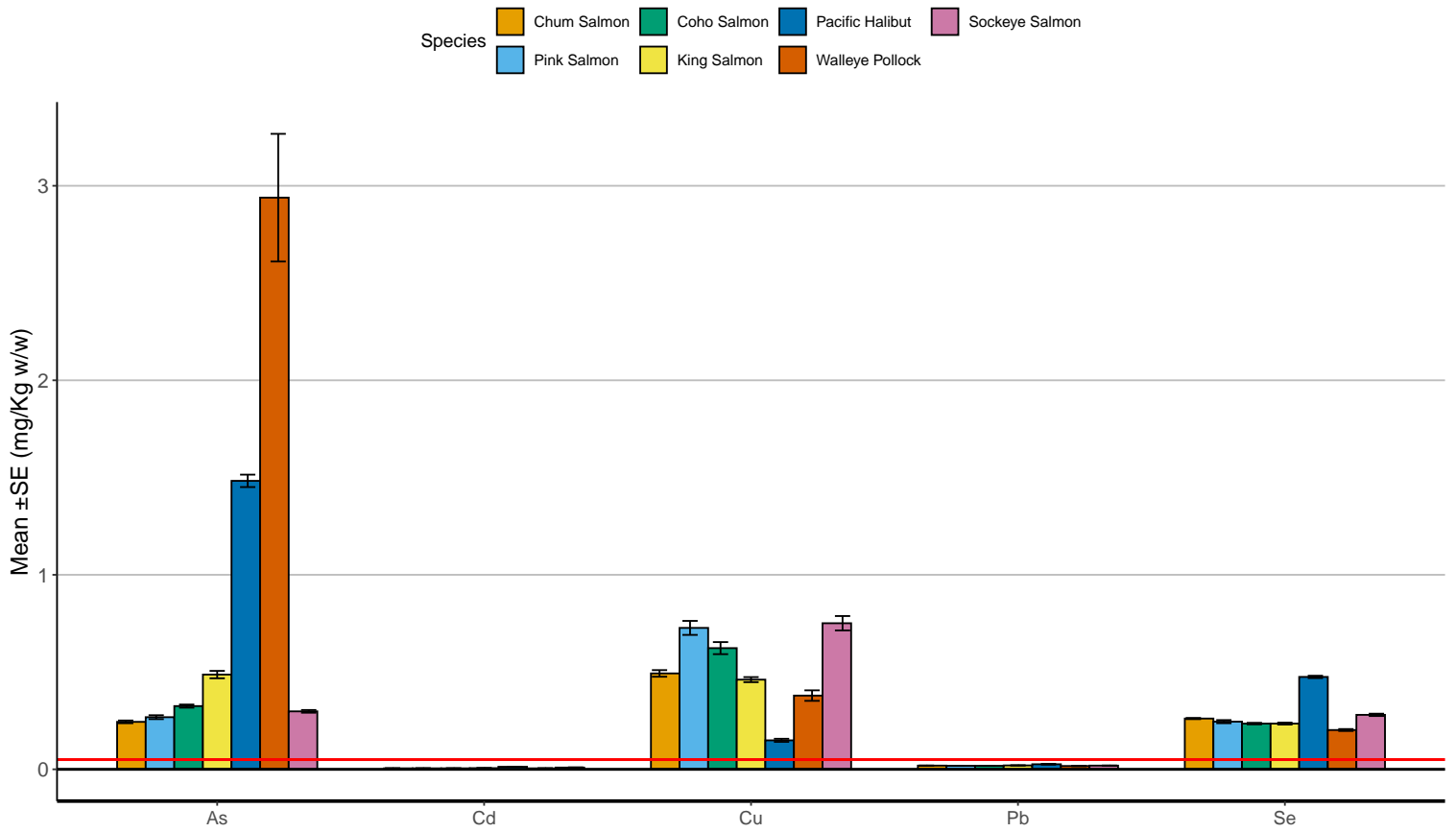


Figure 3: Heavy Metals in Fillet Tissue of FMP Samples. Red line indicates the reporting limit. Samples submitted are not included, only samples previously analyzed by the FMP

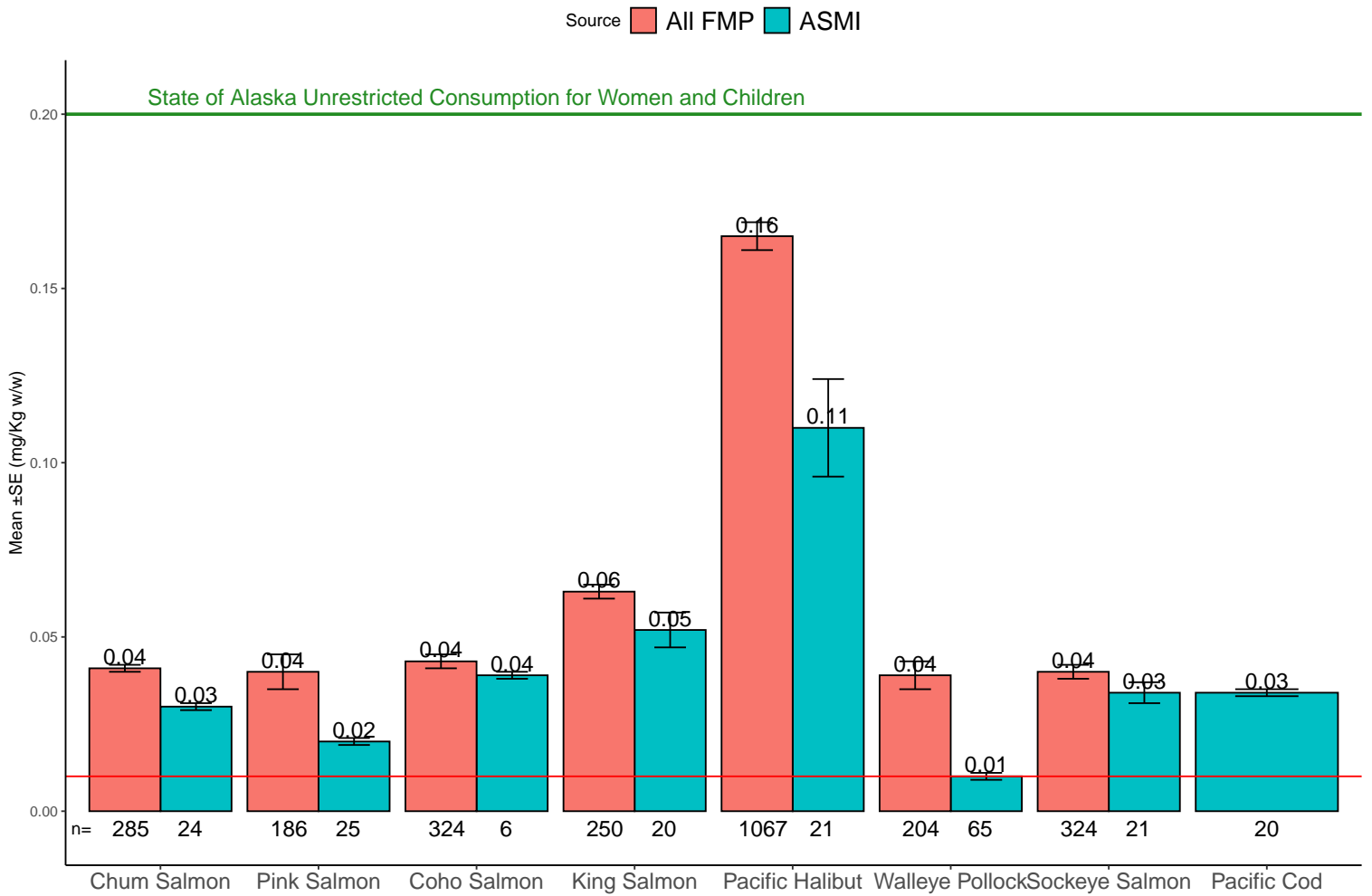


Figure 4: Total Mercury in FMP Samples and ASMI Samples. Red line indicated the Reporting Limit

Source 2014+ FMP ASMI

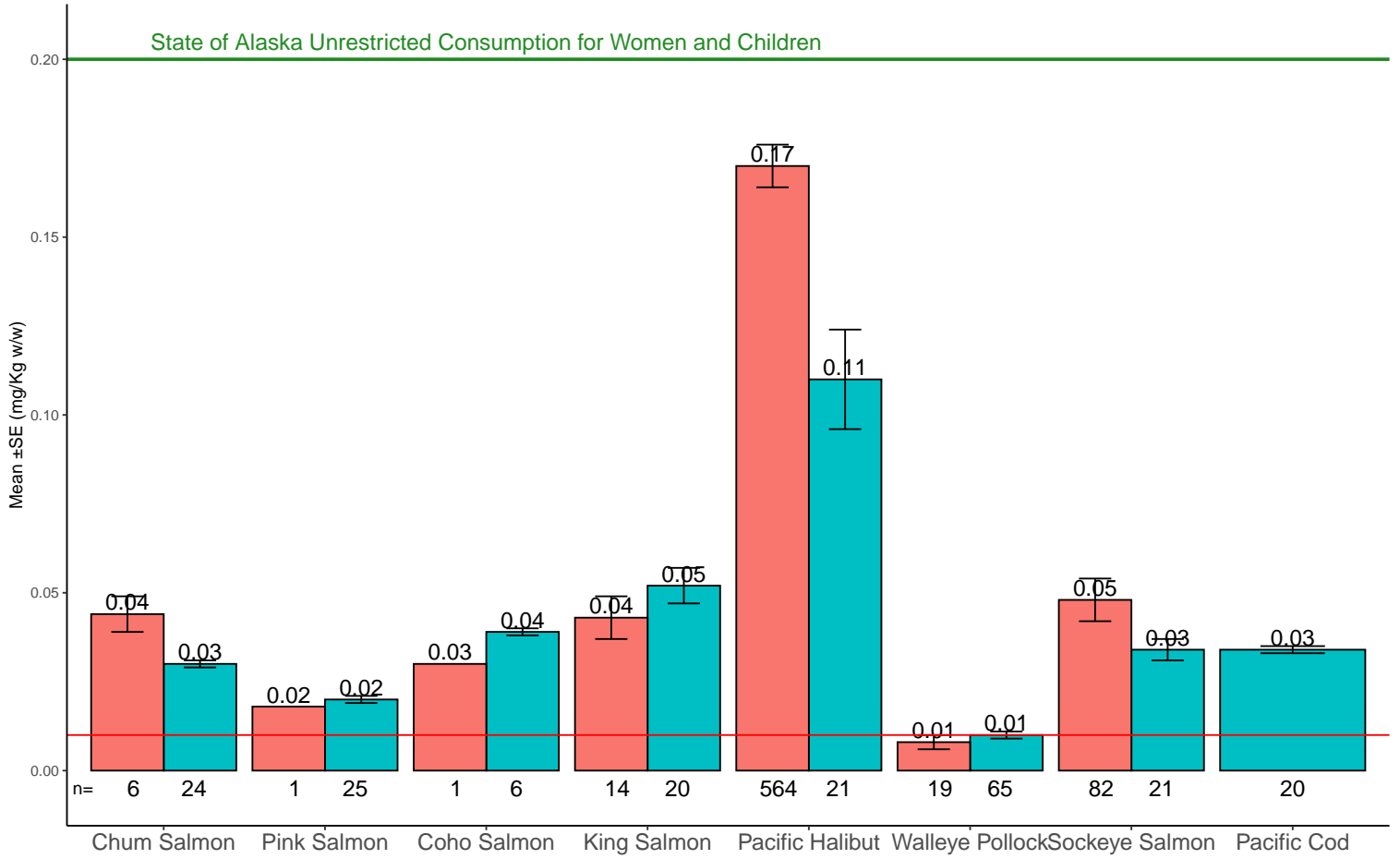


Figure 5: Total Mercury in FMP Samples and ASMI Samples 2014-2023. Red line indicated the Reporting Limit

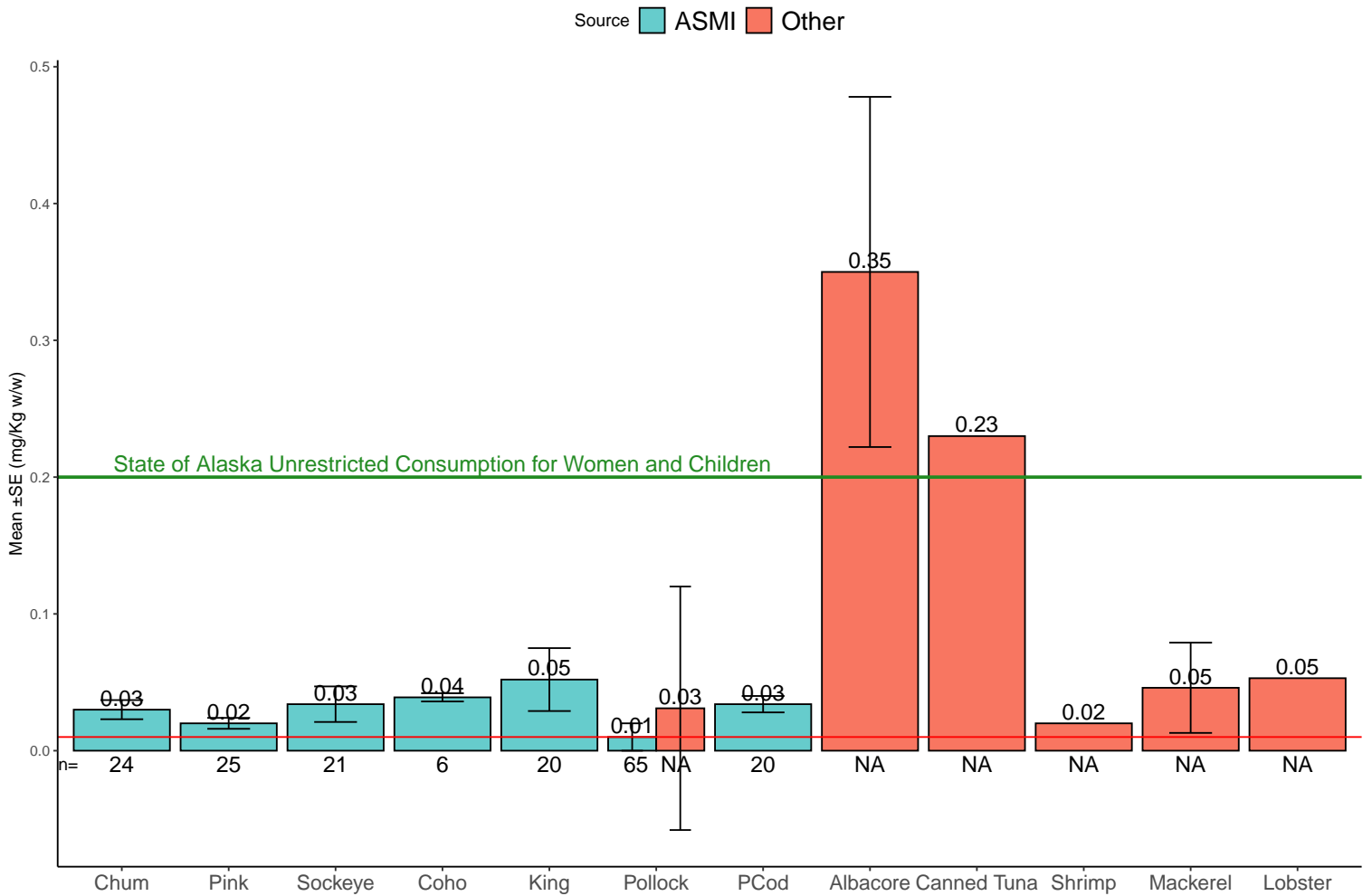
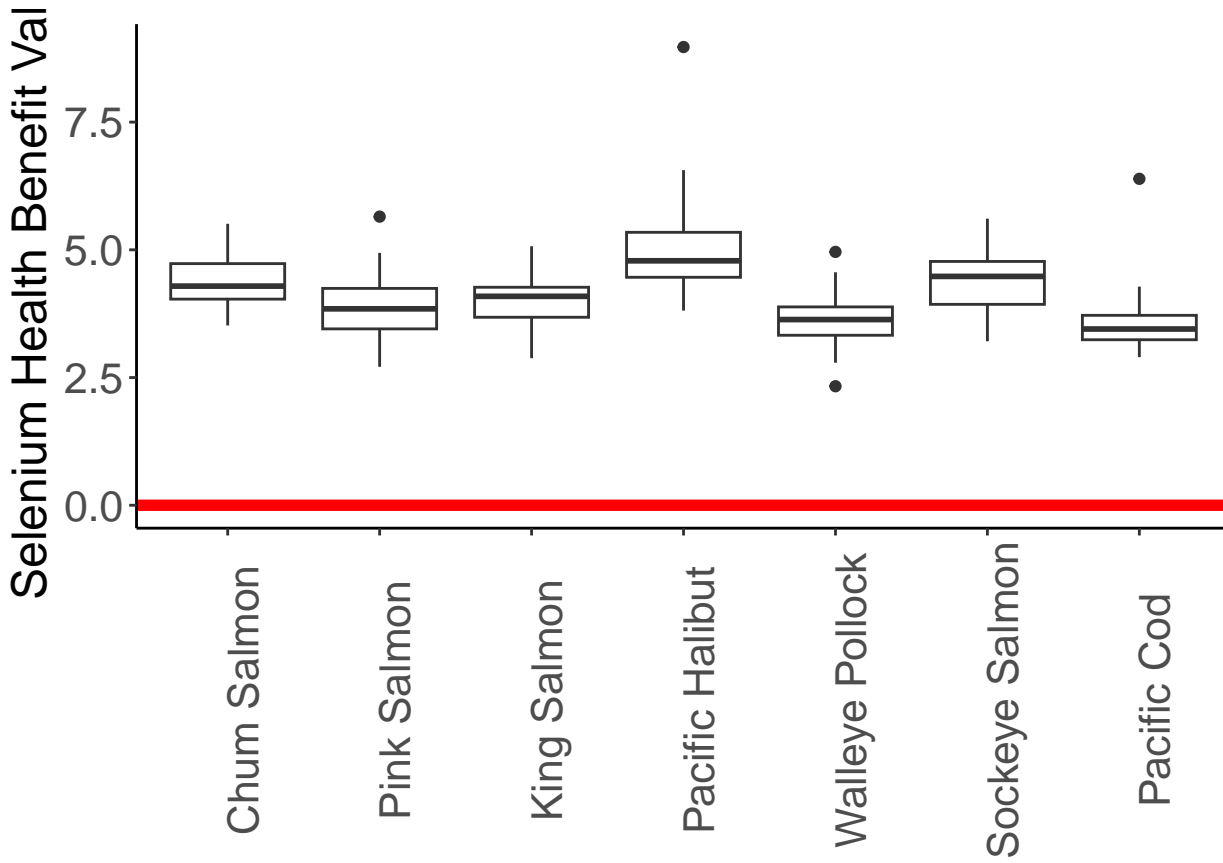


Figure 6: Total Mercury in FMP Samples and ASMI Samples 2014-2023. Red line indicated the Reporting Limit



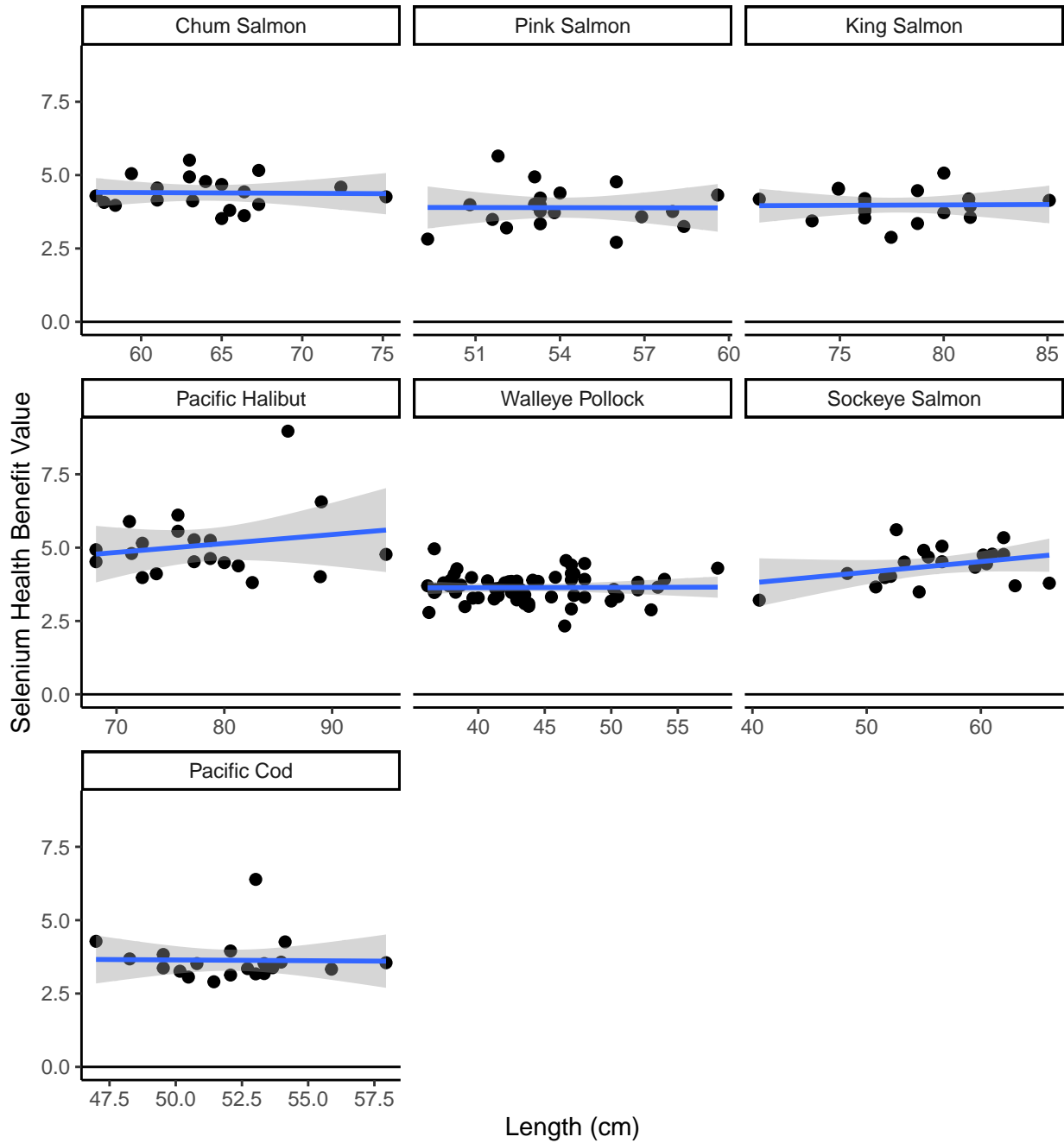


Figure 7: Selenium Health Benefit Value vs. Fish Length for Fish Submitted for Analysis. Selenium Health Benefit value: $HBV_{Se} = ([Se - Hg]/Se) * (Se + Hg)$; molar concentrations must be used

Table 1: Mean of Select Metals in Fish Collected

Species	Analyte	Tissue	n	ND	Mean	SD	SEM	Median	Min	Max
Chum Salmon	As	Fillet	19	0	0.251	0.105	0.024	0.235	0.116	0.621
Chum Salmon	As	Comp	1	0	0.279	NA	NA	0.279	0.279	0.279
Chum Salmon	Cd	Fillet	19	19	ND	NA	NA	ND	0.025	0.025
Chum Salmon	Cd	Comp	1	1	ND	NA	NA	ND	0.025	0.025
Chum Salmon	Cu	Fillet	19	0	0.602	0.106	0.024	0.575	0.447	0.851
Chum Salmon	Cu	Comp	1	0	0.589	NA	NA	0.589	0.589	0.589
Chum Salmon	Pb	Fillet	19	19	ND	NA	NA	ND	0.025	0.025
Chum Salmon	Pb	Comp	1	1	ND	NA	NA	ND	0.025	0.025
Chum Salmon	Se	Fillet	19	0	0.348	0.042	0.01	0.339	0.279	0.435
Chum Salmon	Se	Comp	1	0	0.365	NA	NA	0.365	0.365	0.365
Chum Salmon	Hg	Fillet	23	0	0.03	0.007	0.001	0.031	0.019	0.04
Chum Salmon	Hg	Comp	1	0	0.031	NA	NA	0.031	0.031	0.031
Chum Salmon	Hg	Plug	39	0	0.028	0.006	0.001	0.028	0.017	0.04
Pink Salmon	As	Fillet	20	0	0.283	0.045	0.01	0.288	0.192	0.369
Pink Salmon	As	Comp	1	0	0.317	NA	NA	0.317	0.317	0.317
Pink Salmon	Cd	Fillet	20	20	ND	NA	NA	ND	0.025	0.025
Pink Salmon	Cd	Comp	1	1	ND	NA	NA	ND	0.025	0.025
Pink Salmon	Cu	Fillet	20	0	0.701	0.106	0.024	0.738	0.53	0.877
Pink Salmon	Cu	Comp	1	0	0.741	NA	NA	0.741	0.741	0.741
Pink Salmon	Pb	Fillet	20	20	ND	NA	NA	ND	0.025	0.025
Pink Salmon	Pb	Comp	1	1	ND	NA	NA	ND	0.025	0.025
Pink Salmon	Se	Fillet	20	0	0.307	0.056	0.013	0.304	0.214	0.446
Pink Salmon	Se	Comp	1	0	0.359	NA	NA	0.359	0.359	0.359
Pink Salmon	Hg	Fillet	24	0	0.02	0.004	0.001	0.02	0.013	0.031
Pink Salmon	Hg	Comp	1	0	0.02	NA	NA	0.02	0.02	0.02
Pink Salmon	Hg	Plug	38	2	0.016	0.005	0.001	0.016	0.005	0.028
Coho Salmon	Hg	Fillet	6	0	0.039	0.003	0.001	0.039	0.035	0.042
Coho Salmon	Hg	Plug	20	0	0.033	0.008	0.002	0.031	0.024	0.052
King Salmon	As	Fillet	20	0	0.702	0.227	0.051	0.735	0.397	1.2
King Salmon	Cd	Fillet	20	20	ND	NA	NA	ND	0.025	0.025
King Salmon	Cu	Fillet	20	0	0.461	0.08	0.018	0.448	0.368	0.732
King Salmon	Pb	Fillet	20	20	ND	NA	NA	ND	0.025	0.025
King Salmon	Se	Fillet	20	0	0.318	0.04	0.009	0.324	0.228	0.403
King Salmon	Hg	Fillet	20	0	0.052	0.023	0.005	0.052	0.019	0.089
King Salmon	Hg	Plug	20	0	0.052	0.023	0.005	0.051	0.019	0.094
Pacific Halibut	As	Fillet	20	0	1.599	0.664	0.149	1.51	0.674	3.09
Pacific Halibut	As	Comp	1	0	1.52	NA	NA	1.52	1.52	1.52
Pacific Halibut	Cd	Fillet	20	19	ND	NA	NA	ND	0.025	0.046
Pacific Halibut	Cd	Comp	1	1	ND	NA	NA	ND	0.025	0.025
Pacific Halibut	Cu	Fillet	20	0	0.157	0.02	0.004	0.156	0.123	0.191
Pacific Halibut	Cu	Comp	1	0	0.139	NA	NA	0.139	0.139	0.139
Pacific Halibut	Pb	Fillet	20	19	ND	NA	NA	ND	0.025	0.049
Pacific Halibut	Pb	Comp	1	1	ND	NA	NA	ND	0.025	0.025
Pacific Halibut	Se	Fillet	20	0	0.408	0.09	0.02	0.38	0.315	0.709

Table 1: Mean of Select Metals in Fish Collected (*continued*)

Species	Analyte	Tissue	n	ND	Mean	SD	SEM	Median	Min	Max
Pacific Halibut	Se	Comp	1	0	0.445	NA	NA	0.445	0.445	0.445
Pacific Halibut	Hg	Fillet	20	0	0.109	0.065	0.015	0.105	0.031	0.244
Pacific Halibut	Hg	Comp	1	0	0.121	NA	NA	0.121	0.121	0.121
Pacific Halibut	Hg	Plug	20	0	0.11	0.068	0.015	0.1	0.032	0.235
Walleye Pollock	As	Fillet	60	0	1.415	1.116	0.144	0.954	0.149	4.75
Walleye Pollock	As	Comp	5	0	1.518	0.315	0.141	1.5	1.18	1.94
Walleye Pollock	Cd	Fillet	60	60	ND	NA	NA	ND	0.025	0.025
Walleye Pollock	Cd	Comp	5	5	ND	NA	NA	ND	0.025	0.025
Walleye Pollock	Cu	Fillet	60	0	0.357	0.136	0.018	0.322	0.209	0.959
Walleye Pollock	Cu	Comp	5	0	0.33	0.031	0.014	0.331	0.283	0.368
Walleye Pollock	Pb	Fillet	60	52	ND	NA	NA	ND	0.024	0.052
Walleye Pollock	Pb	Comp	5	5	ND	NA	NA	ND	0.025	0.025
Walleye Pollock	Se	Fillet	60	0	0.287	0.037	0.005	0.288	0.184	0.392
Walleye Pollock	Se	Comp	5	0	0.324	0.028	0.012	0.321	0.29	0.353
Walleye Pollock	Hg	Fillet	60	39	ND	NA	NA	ND	0.002	0.054
Walleye Pollock	Hg	Comp	5	2	0.011	0.006	0.003	0.013	0.004	0.018
Walleye Pollock	Hg	Plug	60	26	0.013	0.012	0.001	0.011	0.002	0.059
Sockeye Salmon	As	Fillet	20	0	0.274	0.071	0.016	0.266	0.154	0.406
Sockeye Salmon	As	Comp	1	0	0.3	NA	NA	0.3	0.3	0.3
Sockeye Salmon	Cd	Fillet	20	20	ND	NA	NA	ND	0.025	0.025
Sockeye Salmon	Cd	Comp	1	1	ND	NA	NA	ND	0.025	0.025
Sockeye Salmon	Cu	Fillet	20	0	0.722	0.121	0.027	0.722	0.489	0.947
Sockeye Salmon	Cu	Comp	1	0	0.671	NA	NA	0.671	0.671	0.671
Sockeye Salmon	Pb	Fillet	20	20	ND	NA	NA	ND	0.025	0.025
Sockeye Salmon	Pb	Comp	1	1	ND	NA	NA	ND	0.025	0.025
Sockeye Salmon	Se	Fillet	20	0	0.347	0.05	0.011	0.354	0.254	0.443
Sockeye Salmon	Se	Comp	1	0	0.355	NA	NA	0.355	0.355	0.355
Sockeye Salmon	Hg	Fillet	20	0	0.034	0.014	0.003	0.029	0.019	0.075
Sockeye Salmon	Hg	Comp	1	0	0.029	NA	NA	0.029	0.029	0.029
Sockeye Salmon	Hg	Plug	53	0	0.036	0.013	0.002	0.034	0.017	0.072
Pacific Cod	As	Fillet	20	0	1.651	1.451	0.325	1.304	0.242	3.59
Pacific Cod	Cd	Fillet	20	20	ND	NA	NA	ND	0.025	0.025
Pacific Cod	Cu	Fillet	20	0	0.18	0.02	0.004	0.18	0.144	0.226
Pacific Cod	Pb	Fillet	20	20	ND	NA	NA	ND	0.025	0.025
Pacific Cod	Se	Fillet	20	0	0.288	0.059	0.013	0.273	0.23	0.505
Pacific Cod	Hg	Fillet	20	0	0.034	0.006	0.001	0.035	0.023	0.051
Pacific Cod	Hg	Plug	20	0	0.044	0.009	0.002	0.044	0.026	0.058

Note:

ND = non-detect

Mean = arithmetic mean

SD = standard deviation

SEM = standard error or mean

Comp = Composite sample (10-12 individuals)

Reporting limit of Pb and Cd = 0.05 mg/Kg

Table 2: Mean Total Mercury in Fish Collected

Species	Analyte	n	ND	Mean	SD	SEM	Geo_Mean	Median	Min	Max	Tissue	Source
Chum Salmon	Hg	24	0	0.030	0.007	0.001	0.029	0.031	0.02	0.04	Fillet	ASMI
Pink Salmon	Hg	25	0	0.020	0.004	0.001	0.020	0.020	0.01	0.03	Fillet	ASMI
Coho Salmon	Hg	6	0	0.039	0.003	0.001	0.039	0.039	0.04	0.04	Fillet	ASMI
King Salmon	Hg	20	0	0.052	0.023	0.005	0.047	0.052	0.02	0.09	Fillet	ASMI
Pacific Halibut	Hg	21	0	0.110	0.064	0.014	0.093	0.108	0.03	0.24	Fillet	ASMI
Walleye Pollock	Hg	65	41	0.010	0.010	0.001	0.007	0.005	0.00	0.05	Fillet	ASMI
Sockeye Salmon	Hg	21	0	0.034	0.013	0.003	0.032	0.029	0.02	0.07	Fillet	ASMI
Pacific Cod	Hg	20	0	0.034	0.006	0.001	0.034	0.035	0.02	0.05	Fillet	ASMI
Chum Salmon	Hg	39	0	0.028	0.006	0.001	0.027	0.028	0.02	0.04	Plug	ASMI
Pink Salmon	Hg	38	2	0.016	0.005	0.001	0.015	0.016	0.00	0.03	Plug	ASMI
Coho Salmon	Hg	20	0	0.033	0.008	0.002	0.032	0.031	0.02	0.05	Plug	ASMI
King Salmon	Hg	20	0	0.052	0.023	0.005	0.047	0.051	0.02	0.09	Plug	ASMI
Pacific Halibut	Hg	20	0	0.110	0.068	0.015	0.091	0.100	0.03	0.23	Plug	ASMI
Walleye Pollock	Hg	60	26	0.013	0.012	0.001	0.009	0.011	0.00	0.06	Plug	ASMI
Sockeye Salmon	Hg	53	0	0.036	0.013	0.002	0.034	0.034	0.02	0.07	Plug	ASMI
Pacific Cod	Hg	20	0	0.044	0.009	0.002	0.043	0.044	0.03	0.06	Plug	ASMI
Chum Salmon	Hg	285	10	0.041	0.014	0.001	0.039	0.039	0.01	0.10	Fillet	All FMP
Pink Salmon	Hg	186	104	0.040	0.069	0.005	0.022	0.013	0.01	0.36	Fillet	All FMP
Coho Salmon	Hg	324	25	0.043	0.033	0.002	0.038	0.039	0.01	0.35	Fillet	All FMP
King Salmon	Hg	250	2	0.063	0.025	0.002	0.058	0.060	0.01	0.16	Fillet	All FMP
Pacific Halibut	Hg	1067	5	0.165	0.141	0.004	0.126	0.120	0.01	1.21	Fillet	All FMP
Walleye Pollock	Hg	204	132	0.039	0.059	0.004	0.019	0.013	0.00	0.39	Fillet	All FMP
Sockeye Salmon	Hg	324	27	0.040	0.028	0.002	0.036	0.037	0.01	0.30	Fillet	All FMP

Note:

Includes some composite samples

