Alaska Department of Environmental Conservation

Office of the State Veterinarian

Fish Monitoring Program

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Copper in Alaska's Fish

Fish Samples collected: 2001-2016

Concentration in mg/Kg wet weight

ND = Non-detect in greater than 50% of fish samples

Visit the Fish Monitoring Program webpage for more information:
http://www.dec.alaska.gov/eh/vet/FMP.html

For State of Alaska fish consumption recommendations visit:
http://www.dhss.alaska.gov/dph/Epi/eph/Pages/fish/default.aspx

Table 1: Copper in Marine Fish

mg/Kg wet weight

Species	Tissue	n	Non Detect	A mean	SD	G mean	Median	Min	Max
Alaska Plaice	Fillet	31	0	0.191	0.028	0.189	0.186	0.152	0.255
Arctic Flounder	Whole Body	4	0	0.558	0.035	0.557	0.555	0.520	0.600
Arctic Sculpin	Whole Body	1	0	1.000	NA	1.000	1.000	1.000	1.000
Atka Mackerel	Fillet	4	0	0.475	0.171	0.456	0.400	0.370	0.730
Atka Mackerel	Whole Body	5	0	0.648	0.118	0.640	0.650	0.520	0.820
Big Skate	Fillet	112	11	0.255	0.098	0.239	0.250	0.100	0.810
Big Skate	Liver	20	0	4.935	2.413	4.410	4.200	1.500	10.000
Black Rockfish	Fillet	23	12	ND	NA	ND	ND	ND	ND
Black Rockfish	Whole Body	7	0	0.706	0.529	0.609	0.530	0.420	1.900
Butter Sole	Whole Body	1	0	0.780	NA	0.780	0.780	0.780	0.780
China Rockfish	Fillet	1	1	ND	NA	ND	ND	ND	ND
Copper Rockfish	Fillet	4	0	0.228	0.034	0.226	0.220	0.200	0.270
Dusky Rockfish	Fillet	40	9	0.203	0.095	0.186	0.182	0.100	0.560
Dusky Rockfish	Whole Body	20	3	0.390	0.206	0.336	0.330	0.110	0.870
Flathead Sole	Fillet	15	0	0.138	0.033	0.134	0.132	0.083	0.192
Fourhorn Sculpin	C-Fillet	1	0	1.850	NA	1.850	1.850	1.850	1.850
Fourhorn Sculpin	Whole Body	6	0	0.974	0.428	0.911	0.825	0.607	1.780
Great Sculpin	Whole Body	2	0	0.410	0.113	0.402	0.410	0.330	0.490
Kelp Greenling	Fillet	1	0	0.180	NA	0.180	0.180	0.180	0.180
Kelp Greenling	Whole Body	18	4	0.614	0.383	0.460	0.630	0.100	1.300
Lingcod	Fillet	166	81	0.185	0.118	0.160	0.155	0.100	0.740
Longnose Skate	Fillet	114	15	0.224	0.116	0.206	0.220	0.100	1.100
Longnose Skate	Liver	20	0	11.775	11.829	9.538	8.750	5.000	60.000
Northernrock Sole	Fillet	20	0	0.143	0.035	0.139	0.138	0.101	0.246
Northernrock Sole	Whole Body	18	0	0.560	0.300	0.496	0.510	0.230	1.400
Pacific Cod	Fillet	56	33	ND	NA	ND	ND	ND	ND
Pacific Halibut	Fillet	1471	788	ND	NA	ND	ND	ND	ND
Quillback Rockfish	Fillet	18	9	ND	NA	ND	ND	ND	ND
Rock Greenling	Whole Body	16	0	0.526	0.113	0.515	0.510	0.320	0.810
Rougheye Rockfish	Fillet	49	15	0.143	0.047	0.136	0.122	0.099	0.261
Sablefish	Fillet	122	34	0.263	0.146	0.226	0.260	0.100	1.100
Sablefish	Whole Body	3	0	0.323	0.046	0.321	0.350	0.270	0.350
Salmon Shark	Fillet	12	0	0.372	0.079	0.365	0.340	0.230	0.490
Shortraker Rockfish	Fillet	8	6	ND	NA	ND	ND	ND	ND
Silvergray Rockfish	Fillet	6	1	0.272	0.148	0.238	0.230	0.100	0.480
Sleeper Shark	Fillet	1	1	ND	NA	ND	ND	ND	ND
Southernrock Sole	Whole Body	1	1	ND	NA	ND	ND	ND	ND
Spiny Dogfish	Fillet	17	1	0.299	0.091	0.284	0.280	0.100	0.480
Starry Flounder	Fillet	1	0	0.290	NA	0.290	0.290	0.290	0.290
Starry Flounder	C-Fillet	3	0	0.700	0.120	0.693	0.720	0.572	0.809
Starry Flounder	Whole Body	1	1	ND	NA	ND	ND	ND	ND
Walleye Pollock	Fillet	23	3	0.372	0.140	0.336	0.370	0.100	0.650
Yelloweye Rockfish	Fillet	59	41	ND	NA	ND	ND	ND	ND
Yellowfin Sole	Fillet	33	0	0.160	0.036	0.156	0.154	0.100	0.277
Yellowtail Rockfish	Fillet	5	1	0.204	0.065	0.193	0.220	0.100	0.280

n = Sample Size; A Mean = Arithmetic Mean; G Mean = Geometric Mean; SD = Standard Deviation;
C = Composite of multiple individuals

Table 2: Copper in Salmonids (Salmon, Whitefish, Grayling, Char)

mg/Kg wet weight

Species	Tissue	n	Non Detect	A mean	SD	G mean	Median	Min	Max
Arctic Char	Fillet	13	1	0.399	0.114	0.375	0.400	0.100	0.540
Arctic Char	Whole Body	10	0	0.959	0.165	0.945	0.975	0.620	1.200
Arctic Cisco	C-Fillet	1	0	0.920	NA	0.920	0.920	0.920	0.920
Arctic Grayling	Fillet	41	3	0.432	0.283	0.376	0.390	0.100	1.700
Arctic Grayling	Whole Body	1	0	1.100	NA	1.100	1.100	1.100	1.100
Arctic Grayling	C-Whole Body	3	0	0.750	0.350	0.691	0.750	0.400	1.100
Bering Cisco	Fillet	5	0	0.457	0.067	0.453	0.461	0.384	0.536
Broad Whitefish	Fillet	48	6	0.295	0.113	0.269	0.292	0.100	0.559
Chum Salmon	Fillet	59	3	0.497	0.142	0.467	0.490	0.100	0.780
Chum Salmon	C-Juvenile	1	0	1.400	NA	1.400	1.400	1.400	1.400
Coho Salmon	Fillet	91	0	0.634	0.313	0.600	0.570	0.390	3.200
Coho Salmon	Belly	10	0	0.612	0.067	0.609	0.610	0.530	0.710
Coho Salmon	Whole Body	57	0	1.355	0.795	1.219	1.100	0.630	6.000
Coho Salmon	Eggs	20	0	6.445	1.699	6.255	6.100	4.000	11.000
Coho Salmon	Testis	6	0	0.305	0.056	0.301	0.300	0.230	0.390
Coho Salmon	Fry Whole	20	0	1.074	0.266	1.045	0.980	0.720	1.600
Coho Salmon	C-Fry	7	0	1.676	1.187	1.392	1.100	0.760	3.500
Coho Salmon	Juvenile Whole	12	0	1.189	1.675	0.843	0.710	0.510	6.500
Coho Salmon	C-Juvenile	1	0	0.820	NA	0.820	0.820	0.820	0.820
Dolly Varden	Fillet	56	0	0.601	0.172	0.578	0.575	0.300	1.130
Dolly Varden	C-Fillet	2	0	0.905	0.134	0.900	0.905	0.810	1.000
Dolly Varden	Whole Body	46	0	0.993	0.270	0.959	0.959	0.620	1.650
Humpback Whitefish	Fillet	100	32	0.258	0.189	0.210	0.220	0.100	1.200
Humpback Whitefish	Whole Body	24	0	1.189	0.593	1.040	1.050	0.310	2.400
King Salmon	Fillet	99	0	0.475	0.141	0.458	0.450	0.260	1.100
King Salmon	Whole Body	15	0	1.033	0.284	1.003	1.000	0.580	1.900
King Salmon	C-Fry	7	0	0.730	0.065	0.727	0.740	0.610	0.800
King Salmon	C-Juvenile	3	0	0.550	0.072	0.547	0.530	0.490	0.630
Least Cisco	Fillet	11	0	0.374	0.155	0.346	0.350	0.190	0.673
Least Cisco	Whole Body	1	0	0.480	NA	0.480	0.480	0.480	0.480
Pink Salmon	Fillet	20	0	0.734	0.167	0.716	0.740	0.480	1.100
Pygmy Whitefish	Whole Body	1	0	1.300	NA	1.300	1.300	1.300	1.300
Round Whitefish	Fillet	12	3	0.241	0.108	0.217	0.255	0.100	0.480
Sheefish	Fillet	36	6	0.302	0.144	0.269	0.300	0.100	0.840
Sheefish	Whole Body	5	0	0.714	0.217	0.681	0.820	0.370	0.920
Sheefish	Eggs	1	0	0.740	NA	0.740	0.740	0.740	0.740
Sheefish	Testis	4	0	0.310	0.018	0.310	0.310	0.290	0.330
Sheefish	Liver	5	0	28.600	21.431	22.289	19.000	10.000	56.000
Sheefish	Kidney	19	0	0.501	0.135	0.486	0.440	0.330	0.830
Sockeye Salmon	Fillet	71	0	0.662	0.181	0.641	0.645	0.410	1.500
Sockeye Salmon	Whole Body	52	0	5.761	3.384	5.099	5.495	0.840	25.500
Sockeye Salmon	Eggs	2	0	12.700	8.910	11.027	12.700	6.400	19.000
Sockeye Salmon	C-Fry	3	0	1.300	0.200	1.290	1.300	1.100	1.500

n = Sample Size; A Mean = Arithmetic Mean; G Mean = Geometric Mean; SD = Standard Deviation;
C = Composite of multiple individuals

Table 3: Copper in Marine Forage Fish

mg/Kg wet weight

Species	Tissue	n	Non Detect	A mean	SD	G mean	Median	Min	Max
Capelin	C-Whole Body	1	0	0.470	NA	0.470	0.470	0.47	0.47
Eulachon	C-Whole Body	7	0	1.119	0.138	1.111	1.200	0.95	1.30
Pacific Herring	C-Fillet	4	0	1.200	0.488	1.135	1.030	0.85	1.89
Pacific Herring	C-Whole Body	11	0	0.860	0.124	0.852	0.880	0.66	1.10
Rainbow Smelt	Whole Body	10	0	0.498	0.106	0.488	0.475	0.38	0.67
Saffron Cod	C-Fillet	2	0	0.675	0.148	0.667	0.675	0.57	0.78
Saffron Cod	Whole Body	20	0	1.059	0.430	0.988	0.940	0.64	1.98
Sand Lance	C-Whole Body	1	0	0.830	NA	0.830	0.830	0.83	0.83

Table 4: Copper in Marine Invertebrates

mg/Kg wet weight

Species	Tissue	n	Non Detect	A mean	SD	G mean	Median	Min	Max
Butter Clam	Invert Whole Tissue	5	0	1.420	0.249	1.400	1.50	1.00	1.60
Butter Clam	C-Invert Whole	1	0	1.400	NA	1.400	1.40	1.40	1.40
Chiton	Invert Whole Tissue	2	0	10.000	0.000	10.000	10.00	10.00	10.00
Cockle	Invert Whole Tissue	5	0	0.786	0.205	0.758	0.84	0.43	0.96
Cockle	C-Invert Whole	1	0	1.100	NA	1.100	1.10	1.10	1.10
Decorator Crab	Invert Whole Tissue	1	0	28.000	NA	28.000	28.00	28.00	28.00
Dungeness Crab	Invert Whole Tissue	2	0	9.700	10.324	6.387	9.70	2.40	17.00
Hermit Crab	Invert Whole Tissue	1	0	23.000	NA	23.000	23.00	23.00	23.00
Ribbon Worm	Invert Whole Tissue	2	0	5.800	4.667	4.770	5.80	2.50	9.10
Scallop	Invert Whole Tissue	20	0	3.775	0.926	3.667	3.70	2.10	5.90
Softshell Clam	Invert Whole Tissue	3	0	2.280	1.630	1.791	2.30	0.64	3.90
Softshell Clam	C-Invert Whole	8	0	2.938	1.016	2.759	3.15	1.50	4.10
Squid	C-Invert Whole	5	0	6.740	1.442	6.620	6.40	5.00	8.90

n = Sample Size; A Mean = Arithmetic Mean; G Mean = Geometric Mean; SD = Standard Deviation;
C = Composite of multiple individuals

Table 5: Copper in Freshwater Fish

mg/Kg wet weight

Species	Tissue	n	Non Detect	A mean	SD	G mean	Median	Min	Max
Burbot	Fillet	7	6	ND	NA	ND	ND	ND	ND
Lake Trout	Fillet	41	1	0.346	0.079	0.335	0.330	0.10	0.50
Lake Trout	Whole Body	33	2	0.720	0.307	0.643	0.690	0.10	1.90
Longnose Sucker	Fillet	3	0	0.497	0.093	0.491	0.470	0.42	0.60
Northern Pike	Fillet	96	55	ND	NA	ND	ND	ND	ND
Northern Pike	Whole Body	40	0	0.652	0.233	0.612	0.625	0.33	1.20
NS Stickleback	C-Whole Body	3	0	1.467	0.468	1.413	1.530	0.97	1.90
Rainbow Trout	Fillet	52	13	0.358	0.186	0.297	0.400	0.10	0.79
Rainbow Trout	Whole Body	11	0	1.736	0.844	1.587	1.500	0.81	3.70
Slimy Sculpin	Whole Body	59	0	0.843	0.244	0.810	0.810	0.34	1.70
Slimy Sculpin	C-Whole Body	10	1	0.951	0.515	0.769	0.800	0.10	1.80
TS Stickleback	C-Whole Body	4	0	1.575	0.340	1.544	1.650	1.10	1.90

n = Sample Size; A Mean = Arithmetic Mean; G Mean = Geometric Mean; SD = Standard Deviation;
C = Composite of multiple individuals

NS = Ninespine, TS = Threespine