# State of Idaho

## Fish & Game Department
## and
## Department of Health

# Mercury Levels in Idaho Fishes and Aquatic Environments, 1970-71

by

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November, 1971

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**ABSTRACT**

During 1970-1971, the Idaho Fish and Game Department collected 1,096 fish, 3 samples of aquatic organisms, 60 water samples, and 17 sediment samples from 93 geographical locations to determine the extent of mercury contamination in Idaho waters. Mercury residue analysis in 1970 was done by neutron activation and in 1971 **by** atomic absorption. Although sources of mercury were not specifically identified, its occurrence in Idaho waters and fish was found to be widespread.

Twenty-six species of fish were tested. There was a relationship between higher levels of mercury in fish with piscivorous food habits compared to fish with plankton/insect diets. Warmwater nongame fish species contained approximately twice the mercury levels found in coldwater (trout and whitefish) game fish species. Mercury levels in fish collected from reservoir environments were higher than those from stream environments draining into the reservoirs. The highest mercury concentration measured in the 1,096 fish sampled was 1.70 **ppm** in a squawfish. Fifty-nine fish or 5.3 percent of the total number of fish collected exceeded the 0.50 ppm mercury residue level set by the FDA as safe for human consumption. However, over half of these were nongame species and seldom utilized by fishermen.

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## Introduction

During July, 1970, the Idaho Fish and Game Department collected 160 fish from 18 geographical locations in Idaho to determine the extent of mercury contamination in Idaho waters. Analysis of the fish tissue was done by neutron activation. The samples *were* activated in the Materials Testing Reactor located at the National Reactor Testlng Station near Arco, Idaho, and examined by Idaho Nuclear Corporation scientists. All but four fish were found to contain detectable mercury residue, ranging as high as 1.70 parts per million (ppm) in concentration ( Gebhards, et al, 1971). The Idaho Department of Health issued a conditional warning regarding the consumption of certain fish species from waters in which those fish exceeded
the 0.50 ppm mercury residue level set by the U. S. Food and Drug Administration.

Sampling was continued in 1971. Analysis for mercury was done by atomic absorption technique at the Idaho Department of Health Laboratory, Boise, Idaho. Collections Included 936 fish, 3 samples of aquatic organisms, 60 water samples, and 17 sediment samples from 75 areas,
Tables 1 through 4 summarize the data collected in 1970 . a n d 1971, representing 26 species of fish (1,096 individual fish) from 93 locations (see Figure 1). Analysis Techniques

Sample preparation and irradiation for the neutron activation analysis done in 1970 is described in the Journal of the Idaho Academy of Science, Special Research Issue No. 2 (Berreth and George, 1971).

In 1971, attempts were made to collect fish of the same species in groups of five of similar size in order to minimize variation that may exist between age classes. Ten grams of muscle tissue were removed anterior to the dorsal fin. A composite sample was prepared by grinding together the ten grams of muscle tissue from each of the five fish. A ten. gram sample of the homogenous mixture was then taken and subjected to $HN0_3$ -H2SO4 digestion and extraction in

preparation for total mercury analysis. Detectable limits using the Perkin-Elmer Model 303, atomic absorption cool vapor apparatus system were 0.0002 ppm for water samples and 0.002 ppm for animal tissue and sediments. Results are expressed in total mercury in ppm based on wee weight of the sample. Sample preparation and analysis were done by personnel of the Idaho Department of Health, Laboratories Division.

Discusslon

Although nearly one-third of the water samples showed no detectable mercury (less than 0.0002 ppm), mercury residues were found in fish from all of the 93 areas sampled in 1.920-1971. Point sources of mercury contamination in Idaho waters could not be identified, however, several possible sources exist and need further investigation,

Cinnabar (mercuric sulfide) occurs widely in Idaho and has been commercially mined at two locations: one on the East Fork of the South Fork of Salmon River near Stibnite, and the other 11 miles east of Weiser (Bailey, 1964). Sediment samples collected near Stibnite were extremely high in mercury concentration (Table 1).

Geological sources of mercury are probably the major contributors to mercury residues in fish in areas where man's activities have been limited. Lower Rainbow Lake, near Trinity Mountain in southern Idaho lies at 8,000 feet elevation, is accessible only by trail, and supports a self-sustaining population of rainbow trout. Mercury levels in these fish averaged 0.085 ppm. Data from wild fish in other waters indicates that natural background levels of mercury in Idaho trout specles may range from 0.010 ppm to 0.130 ppm.

Mercurial seed treatment on 766,000 acres of winter wheat and 211,000 acres of spring wheat in Idaho has been estimated to be equlvalent to 720 pounds of mercury annually.. These fungicides may he a possible source of water contamination due to field drainage and irrigation return water in certain areas.

A source of mercury in the metallic form dates back to mining activities of early 1860's. Quicksilver (electrical mercury) was utilized in stamp milling, dredging, and to a small degree.at placer mining for gold„ The Idaho Historical Society reported that. one mill at Silver City, in southwestern Idaho, "lost" 2 1/2 tons of mercury during 1866- 1868. An abandoned mill in the same area at DeLamar has been the site of recent commercial reclamation of quicksilver from the mill taillngs, Free mercury can be seen as small beads in the rock crevices and in the soil at the mill site. SIlver City and DeLamar border Jordan Creek. Suckers collected from Jordan Creek averaged 0.520 ppm mercury residue. Rainbow trout averaged 0.231 ppm mercury, which was considerably higher than rainbow sampled from other small stream environments. Rainbow trout and suckers collected in Flint Creek, a tributary to Jordan Creek outside the influence of mining activities, averaged only 0.102 ppm and 0.775 ppm mercury respectively, Fish collected from Antelope Reservoir in Oregon, which receives wet ors from Jordan Creek, contained much higher mercury residues then those collected i" the stream above the reservoir. Mercury residue in 5 suckers Lest d from Antelope Reservoir averaged 0.742 ppm and 5 rainbow trout averaged 0,910 ppm.

The highest mercury concentration in the water and sediment samples were collected from the lower Coeur d'Aiene River. These elevated mercury levels are thought to originate from the South Fork of the Coeur d'Alene River which receives mine-mill effluents,.. Fish and water samples collected above the confluence of the South Fork were low in mercury. Although Coeur d'Alene Lake has been the final recipient of mine wastes for over 70 years, contamination by mercury is not reflected in fish collected from the lake (kokanee-0.058 ppm; perch-0.045 ppm). This leads to speculation that the toxic nature of the heavy-met al mine wastes entering, the lake may inhibit the development of methylating organisms and ultimate conversion of mercury to an organic form.

No attempt was made to compare data from 1970 with 1971 due to the small number of fish sampled in any particular water and difference in analysis techniques. Sample preparation for the neutron activation analysis done in 1970 included freeze-drying of the. sample prior to placement in a quartz ampule. Limited experimentation with dried pheasant meat samples indicated that 15 to 50 percent of the mercury present in the wet meat could be lost in the freeze-drying process (Berreth and George, 1971). Test results on the 1970 fish samples, therefore, may be somewhat less than the absolute amount of mercury present prior to freeze-drying. This may account in part for the lower levels of mercury in American Falls Reservoir perch in 1910 compared with 1971 (Table I).

Table 1 summarizes mercury residues in fish, aquatic organisms, waters, and sediments collected in 1970 and 1971 by location. A wide variance in mercury contents was found between species inhabiting the same waters. Warmwater and nongame fish species contained approximately twice the mercury levels found in coldwater game fish species (Table 2). This could be attributed to differentiation in physiology or food habits between species. There appears to be a relationship between higher mercury levels and piscivorous food habits as evidenced in squawfish, brown trout, Dolly Varden, large kamloops, and rainbow and cutthroat trout over 5 pounds in weight which have converted from plankton/insect diets to small fish. Rainbow trout less than 2 pounds collected from American Falls Reservoir averaged 0. 256 ppm mercury whereas larger rainbow and cutthroat trout 5 to 6 pounds in weight averaged 0.910 ppm and 0.822 ppm respectively.

Mercury levels in fish collected from reservoir environments were higher than those collected from stream environments draining into the reservoirs. Table 3 shows a comparison of mercury residues in reservoir fish and fish up-stream from the receiving reservoirs. Movement of sediments in streams and running water may inhlbit the methylization of mercury, resulting in lower residues in stream fish.

Fish were tested from one nation fish hatcher, end -even Idaho Fish and Game hatcheries (Table 4), Mercury residues ranged from less than 0.002 ppm to 0,186 ppm. Analysis of dry fish feed constituents need in the Idaho Fish and Game Department feed formula snowed herring meal to be highest in mercury residue (Table 5).

For many years, nongame fish (i.e suckers, carp, Utah chub) have been used extensively as a supplemental feed a.l commercial trout hatcheries in southern Idaho. Following publlcation of the mercury residue levels in fish from American Falls Reservoir and Snake River in 1970, the use of nongame fish as trout feed has been drastically cut. The commercial fish landings reported by commercial fishermen to the Idaho Flsh and Game Department in 1971 were only 362,000 pounds compared wlth an average of 1,023,000 pounds for the same period in 1969 and 1970. The bulk of these fish are sold to commercial trout hatcheries with only a small percentage utilized for human consumption.

Summary

Analysis of fish tissue, water, and bottom sediments collected durlng 1970 and 1971 indicated widespread occurrence of mercury in Idaho aquatic environments. Sources of mercury contamination were not identified by the survey,

The highest mercury concentration measured in the 1,096 fish sampled was 1.70 ppm in a squawfish. Fifty-nine fish or 5.3 percent of the total number of fish collected during 1970-71 exceeded the 0,50 ppm mercury residue level set by the FDA as safe for human consumption. However, over half of these were nongame species and are seldom utilized by fishermen.

Literature Cited

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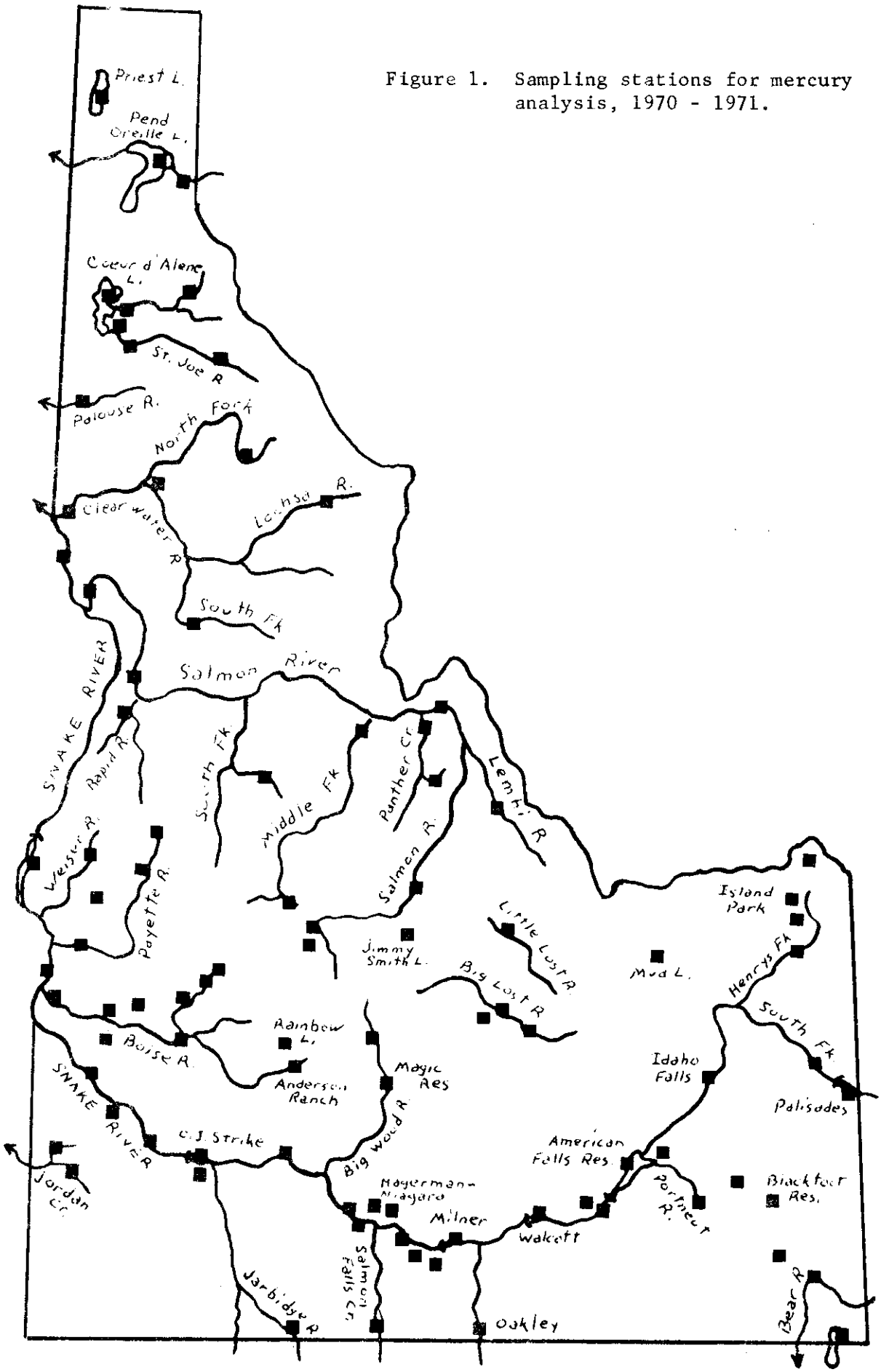


Figure 1. Sampling stations for mercury analysis, 1970 - 1971.

Table 1. Mercury Residues in Idaho Fishes, Aquatic Organisms, Waters, and Sediments by Location, 1970-1971.

| Location | Species | Sample No. | Average Hg ppm | $H_2O$ - Hg ppm | Sediment - Hg ppm |
|---|---|---|---|---|---|
| (Northern Idaho) | | | | | |
| Chatcolet Lake | Perch | 10 | .094 | Neg.** | .020 |
| *Clark Fork River | Perch | 1 | .100 | .0009 | |
| | Squawfish | 5 | .122 | | |
| | Shiner | 1 | .260 | | |
| | Sucker | 1 | .510 | | |
| | Peamouth Chub | 2 | .250 | | |
| | Rainbow | 1 | .150 | | |
| *Clearwater River | Smallmouth Bass | 9 | .048 | Neg. | |
| | Rainbow | 2 | .223 | | |
| | Steelhead Adults | 10 | .140 | | |
| | Chiselmouth | 1 | .070 | | |
| | Squawfish | 1 | .130 | | |
| Clearwater, North Fork | Steelhead Juvenile | 10 | .008 | | |
| Clearwater, South Fork | Rainbow | 5 | .065 | | |
| Coeur d'Alene Lake | Kokanee | 10 | .058 | Neg. | .1180 |
| | Perch | 10 | .045 | .0062 | |
| Coeur d'Alene (Springton) | | | | .0085 | 2.400 |
| Coeur d'Alene Drainage (Tepee Creek) | Cutthroat | 10 | .013 | .0012 | |
| Lochsa River (Squaw Creek) | Whitefish | 4 | .020 | | |

Table 1 Continued.

| Location | Species | Sample No. | Average Hg ppm | $H_2O$ - Hg ppm | Sediment - Hg ppm |
|---|---|---|---|---|---|
| *Palouse River | Crappie | 1 | .310 | | |
| | Sunfish | 1 | .080 | | |
| | Sucker | 3 | .240 | | |
| | Squawfish | 3 | .207 | | |
| Pend Oreille Lake | Kokanee | 10 | .106 | | |
| | Kamloops | 10 | .482 | .0008 | |
| | Perch | 10 | .048 | | |
| Priest Lake | Cutthroat | 10 | .029 | .0005 | |
| | Whitefish | 10 | .029 | | |
| St. Joe River (St. Maries) | | | | .0002 | .0170 |
| St. Joe River (Red Ives) | | | | .0002 | |
| (Central Idaho) | | | | | |
| Lemhi River | Rainbow | 10 | .113 | .0010 | |
| | Whitefish | 10 | .130 | | |
| Marsh Creek (M. Fk. Salmon) | | | | .0008 | |
| Napias Creek (Salmon R.) | | | | .0008 | |
| Panther Creek (Salmon R.) | | | | .0005 | |
| *Rapid River | Dolly Varden | 4 | .340 | .0023 | |
| Redfish Lake | Kokanee | 3 | .040 | Neg. | |

Table 1 Continued.

| Location | Species | Sample No. | Average Hg ppm | $H_2O$ - Hg ppm | Sediment - Hg ppm |
|---|---|---|---|---|---|
| Salmon River (Mouth) | | | | .0013 | |
| Salmon River (Riggins) | Sucker | 3 | .350 | .0008 | |
| Salmon River (North Fork) | Rainbow | 1 | .245 | | .0050 |
| | Whitefish | 10 | .125 | .0012 | |
| | Shiner | 5 | .045 | | |
| | Chiselmouth | 5 | .173 | | |
| Salmon River (Challis) | Chinook Smolt | 5 | .275 | | |
| | Rainbow | 1 | .312 | .0020 | |
| | Whitefish | 10 | .163 | | |
| | Sucker | 10 | .189 | | |
| *Salmon River(Stanley) | Rainbow | 1 | .060 | | |
| | Chinook Smolt | 3 | .060 | | |
| | Cutthroat | 1 | .110 | | |
| Salmon River, Middle Fork | Rainbow | 1 | .032 | | |
| | Cutthroat | 1 | .132 | Neg. | |
| Salmon River, East Fork, South Fork | Rainbow | 1 | .479 | | 11.740 (Stibnite) |
| | Cutthroat | 1 | .038 | | .690 |
| (Southwestern Idaho) | | | | | |
| Anderson Ranch Res. | Kokanee | 2 | .048 | | .0350 |
| | Coho | 5 | .048 | | |
| | Dolly Varden (16-inch) | 5 | .692 | | |
| | Perch | 2 | .280 | | |
| | Squawfish | 9 | .402 | | |
| | Sucker | 10 | .184 | | |
| Big Wood River | Rainbow | 10 | .014 | .0010 | |
| | Whitefish | 10 | .024 | | |

Table 1 Continued.

| Location | Species | Sample No. | Average Hg ppm | $H_2O$ - Hg ppm | Sediment - Hg ppm |
|---|---|---|---|---|---|
| Boise River | *Carp | 2 | .395 | Neg. | |
| Cascade Reservoir | Coho | 2 | .058 | .0035 | |
| Cove Arm Reservoir | Rainbow | 5 | .016 | | |
| Grasmere Reservoir | | | | .0002 | .0260 |
| Grimes Creek | | | | Neg. | .0310 |
| Indian Creek | Rainbow | 2 | .002 | | |
| Jarbidge River | Whitefish | 4 | .058 | .0009 | |
| Jimmy Smith Lake | Rainbow | 10 | .105 | .0006 | |
| *Jordan Creek | Rainbow | 29 | .231 | (above DeLamar) Neg.<br>(above Silver City) Neg.<br>(at Rabbit Creek) Neg. | |
| | Sucker | 7 | .520 | | |
| Jordan Creek (Flint Creek) | Rainbow | 15 | .102 | | |
| | Sucker | 5 | .275 | | |
| *Lake Lowell | Perch | 10 | .264 | | |
| | Bluegill | 1 | .120 | | |
| | Crappie | 14 | .169 | | |
| | Bullhead | 2 | .175 | | |
| | Carp | 1 | .310 | | |
| Lower Rainbow Lake | Rainbow | 5 | .085 | | |
| Lucky Peak Reservoir | Sucker | 4 | .398 | | |

Table 1 Continued.

| Location | Species | Sample No. | Average Hg ppm | $H_2O$ - Hg ppm | Sediment - Hg ppm |
|---|---|---|---|---|---|
| Magic Reservoir | Rainbow | 10 | .052 | .0008 | |
| | Perch | 10 | .134 | | |
| | Midge Larvae | | .009 | | |
| | Gammarus | | .004 | | |
| | Plankton | | .004 | | |
| Mores Creek (above Idaho City) | | | | .0012 | |
| Mores Creek (below Idaho City) | | | | Neg. | |
| Murtaugh Lake | Perch | 3 | .085 | Neg. | |
| | Utah Chub | 10 | .081 | | |
| | Carp | 10 | .181 | | |
| Paddock Reservoir | | | | Neg. | .0670 |
| Payette Lake | Squawfish | 10 | .019 | | |
| | Sucker | 5 | .002 | | |
| Payette River | Whitefish | 4 | .100 | .0010 | |
| | Bluegill | 7 | .136 | | |
| Rock Creek (Twin Falls) | | | | Neg. | |
| Salmon Falls Creek Res. | Rainbow | 9 | .026 | | |
| | Perch | 5 | .026 | | |
| | Sucker | 10 | .284 | | |
| Sinker Creek (Owyhee County) | Rainbow | 3 | .026 | Neg. | |
| Weiser River (above Cambridge) | Whitefish | 3 | .120 | Neg. | |
| | Sucker | 3 | .190 | | |

Table 1 Continued.

| Location | Species | Sample No. | Average Hg ppm | $H_2O$ - Hg ppm | Sediment - Hg ppm |
|---|---|---|---|---|---|
| (Southeastern Idaho) | | | | | |
| Alexander Reservoir | Carp | 10 | .415 | .0005 | .0150 |
| Bear Lake | Cisco | 10 | .088 | | |
| | Carp | 10 | .225 | | |
| Bear River | | | | .0008 | |
| Big Lost River | Rainbow | 5 | .073 | .0008 | |
| | Brook Trout | 3 | .127 | | |
| Blackfoot Reservoir | Rainbow | 18 | .079 | | .0076 |
| | Cutthroat | 8 | .130 | Neg. | |
| | Coho | 5 | .070 | | |
| | Sucker | 15 | .220 | | |
| | Carp | 15 | .135 | | |
| Chesterfield Res. | Utah Chub | 10 | .088 | .0002 | |
| Henry's Lake | Cutthroat | 10 | .015 | Neg. | |
| Island Park Res. | Rainbow | 10 | .021 | .0006 | |
| | Whitefish | 6 | .043 | | |
| | Sucker | 3 | .002 | | |
| Little Lost River | Rainbow | 10 | .014 | .0010 | |
| Mackay Reservoir | Rainbow | 10 | .186 | .0009 | .0230 |
| Mud Lake | Perch | 5 | .062 | .0006 | |
| Oakley Reservoir | Sucker | 10 | .076 | | |
| Portneuf River | Rainbow | 10 | .080 | .0013 | |
| | Sucker | 10 | .196 | | |

Table 1 Continued.

| Location | Species | Sample No. | Average Hg ppm | $H_2O$ - Hg ppm | Sediment - Hg ppm |
|---|---|---|---|---|---|
| Spring Creek (tributary to American Falls Reservoir) | Rainbow | 1 | .110 | | |
| | Sucker | 3 | .907 | | |
| (Snake River - main stream and its impoundments) | | | | | |
| Palisades Reservoir | Cutthroat | 10 | .057 | .0010 | .0130 |
| | Brown | 2 | .172 | | |
| Snake River, South Fork | Cutthroat | 10 | .039 | .0075 | |
| | Whitefish | 10 | .042 | | |
| | Sucker | 10 | .090 | | |
| Snake River, Henry's Fork | Rainbow | 10 | .038 | | |
| | Sucker | 10 | .002 | | |
| Snake River, Idaho Falls | Whitefish | 1 | .080 | | |
| | Utah Chub | 5 | .210 | | |
| | Sucker | 4 | .175 | | |
| American Falls Res. | Rainbow (1/2 - 2 lbs.) | 16 | .256 | .0018 | .0160 |
| | Rainbow (over 5 lbs.) | 3 | .910 | | |
| | Cutthroat (1 - 6 lbs.) | 5 | .822 | | |
| | Whitefish (12 - 15 inches) | 6 | .173 | | |
| | Brown Trout (17 inch) | 1 | .940 | | |
| | Coho (12 inch) | 2 | .120 | | |
| | Perch (12 - 14 inches) | 10 | .880 (range .675 - 1.665) | | |
| | *Perch | 7 | .474 (range .090 - .840) | | |
| | *Bullhead | 3 | .133 | | |

Table 1 Continued.

| Location | Species | Sample No. | Average Hg ppm | $H_2O$ - Hg ppm | Sediment - Hg ppm |
|---|---|---|---|---|---|
| American Falls Reservoir cont. | *Utah Chub | 4 | .570 | | |
| | Carp | 6 | .230 | | |
| | Sucker | 6 | .558 | | |
| Snake River (below American Falls) | Rainbow ( 5 - 10 lbs.) | 3 | .128 | | |
| Lake Walcott (Minidoka Reservoir) | Utah Chub | 9 | .607 | .0015 | |
| | Sucker | 10 | .265 | | |
| Milner Reservoir | Sucker | 10 | .171 | .0018 | |
| Snake River, Twin Falls | Carp | 5 | .225 | | |
| | Squawfish | 1 | .600 | | |
| Snake River, Upper Salmon Falls | Sucker | 10 | .208 | .0008 | |
| Snake River, Lower Salmon Falls | Whitefish | 7 | .043 | | |
| Snake River, King Hill | Channel Cat | 1 | .516 | | |
| *C. J. Strike Reservoir | Rainbow | 1 | .180 | | |
| | Perch | 13 | .292 | | |
| | Crappie | 8 | .172 | | |
| | Squawfish | 1 | .290 | | |
| Snake River, Grandview | Crappie | 10 | .016 | | |
| Snake River, Swan Falls | Squawfish | 1 | .037 | | |

Table 1 Continued.

| Location | Species | Sample No. | Average Hg ppm | $H_2O$ - Hg ppm | Sediment - Hg ppm |
|---|---|---|---|---|---|
| Snake River, Fort Boise | *Channel Catfish (10 inch) | 10 | .472 | | |
| | Channel Catfish (10 inch) | 9 | .116 | | |
| *Brownlee Reservoir | Largemouth Bass | 3 | .367 | | .0158 |
| | Smallmouth Bass | 2 | .529 | Neg. | |
| | Bluegill | 1 | .600 | | |
| | Channel Catfish | 16 | .366 | | |
| | Carp | 1 | .240 | | |
| | Squawfish | 1 | .730 | | |
| | Sucker | 9 | .302 | | |
| *Snake River (between mouth of Salmon River and Lewiston) | Smallmouth Bass | 12 | .240 | | |
| | Channel Catfish | 2 | .504 | Neg. | |
| | Carp | 1 | .008 | | |
| | Sucker | 1 | .110 | | |
| | Squawfish | 7 | .400 | | |
| | Shiner | 4 | .062 | | |
| | Chiselmouth Chub | 3 | .113 | | |

*All or part of collections made in 1970.
**Less than 0.0002 ppm

Table 2. Mercury Residues in Idaho Fishes by Species, 1970-1971.

| Species | Sample No. | Aver. - Hg ppm |
|---|---|---|
| Coldwater Species | | .112 |
| Hatchery Rainbow | 41 | .057 |
| Wild Rainbow | 218 | .094 |
| Steelhead - Juvenile (Hatchery) | 20 | .050 |
| Steelhead - Juvenile (Wild) | 10 | .008 |
| Steelhead - Adult | 10 | .140 |
| Kamloops - Adult | 10 | .482 |
| Cutthroat | 66 | .106 |
| Dolly Varden | 9 | .533 |
| Brook Trout | 3 | .127 |
| Brown Trout | 3 | .438 |
| Kokanee | 25 | .074 |
| Coho (Resident) | 14 | .068 |
| Chinook - Juvenile (Wild) | 8 | .194 |
| Chinook - Juvenile (Hatchery) | 10 | .116 |
| Chinook - Adult | 5 | .051 |
| Whitefish | 95 | .121 |
| Cisco | 10 | .088 |
| Warmwater Species | | .211 |
| Largemouth Bass | 3 | .367 |
| Smallmouth Bass | 23 | .190 |
| Sunfish | 10 | .175 |
| Crappie | 33 | .138 |
| Yellow Perch | 96 | .242 |
| Channel Catfish | 38 | .214 |
| Bullhead Catfish | 5 | .150 |

Table 2 Continued.

| Species | Sample No. | Aver. - Hg ppm |
|---|---|---|
| Nongame Species | | .217 |
| Squawfish | 39 | .247 |
| Utah Chub | 38 | .276 |
| Peamouth Chub | 2 | .250 |
| Chiselmouth Chub | 9 | .142 |
| Redside Shiner | 10 | .074 |
| Carp | 61 | .167 |
| Sucker | 172 | .227 |

Table 3. Comparison of Mercury Residues in Stream and Reservoir Fishes.

| Location | Species | Average - Hg ppm |
|---|---|---|
| Big Wood River | Rainbow | .014 |
| Magic Reservoir | Rainbow | .052 |
| Big Lost River | Rainbow | .073 |
| Mackay Reservoir | Rainbow | .186 |
| Snake River (South Fork) | Sucker | .090 |
| Snake River (Henry's Fork) | Sucker | .002 |
| Snake River (Idaho Falls) | Sucker | .175 |
| American Falls Reservoir | Sucker | .558 |
| Jordan Creek | Sucker | .520 |
| Antelope Reservoir (Oregon) | Sucker | .742 |
| Jordan Creek | Rainbow | .231 |
| Antelope Reservoir (Oregon) | Rainbow | .910 |

Table 4. Mercury Residues in Idaho Hatchery Fish, 1970-1971.

| Fish Hatchery | Species | Sample No. | Average - Hg ppm |
|---|---|---|---|
| *American Falls | Rainbow | 5 | .118 |
| *Ashton | Rainbow | 6 | .092 |
| Dworshak National | Steelhead (Smolts) | 10 | .015 |
| Eagle | Rainbow | 10 | Neg.** |
| Hagerman (State) | Rainbow | 10 | .106 |
| Mackay | Rainbow | 10 | .186 |
| Niagara Springs | Steelhead (Smolts) | 10 | .095 |
| Rapid River | Chinook Smolts | 10 | .116 |
| | *Chinook Adults | 5 | .110 |

*Sampled in 1970
**Less than 0.002 ppm

Table 5. Mercury Residues in Dry Fish Feed (Idaho Fish and Game Formula), 1971.

| Ingredient | Percent in Formula (Wt.) | Hg - ppm |
|---|---|---|
| Composite Sample | | .060 |
| Canadian Herring Meal (Sample #1) | 31 | .170 |
| Canadian Herring Meal (Sample #2) | | .165 |
| Canadian Herring Meal (Sample #3) | | .063 |
| Canadian Herring Meal (Sample #4) | | .102 |
| Fish Oil | 2 | .020 |
| Blood Meal (Sample #1) | 5 | .005 |
| Blood Meal (Sample #2) | | .004 |
| Meat Scrap Meal | 10 | .038 |
| Delactosed Whey | 8 | .008 |
| Soybean Flour Meal | 10 | .005 |
| Kelp Meal | 3 | .018 |
| Wheat Middlings | 19 | .002 |