Mercury in Catfish and Bass from the Snake River in Idaho

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During the Fall of 1970, 1000 environmental samples were tested by neutron activation for mercury at the Materials Testing Reactor near Arco, Idaho. Included among the samples were 160 fish representing 19 species collected from throughout the state. Ninety-eight percent of the samples contained mercury with the highest residues being over 6 ppm. Nineteen percent of the samples contained levels exceeding the 0.5 ppm F.D.A. guideline for mercury residues in human food. Results (GEBHARDS, CLINE, et al., 1971) indicate that fish collected in reservoir impoundments contained greater mercury residues than those tested from free flowing portions of the river.

Nine hundred and thirty-six additional samples were tested in 1971. At this time it was also noted that bottom feeders and larger fish with piscivorous food habits contained higher mercury levels (GEBHARDS, SHIELDS, et al., 1971) and that the impoundment area specimens also contained higher mercury levels.

Several studies (BACHE, et al., 1971; BLIGHT, 1970; JOHNELS AND WESTERMARK, 1969) have indicated that higher levels of mercury in fish are a function of the length of time in which the species is exposed to the pollutant; hence, larger and older fish should contain higher levels of mercury.

Fishing for small mouth bass and channel catfish in the Snake River and in three of the large reservoir impoundments in the Hells Canyon area is enjoyed by many Idaho and Oregon fishermen. Because of the possible human risk from eating fish containing high levels of mercury, monitoring was undertaken to determine differences, if any, between fish taken in the impoundment areas and, at the same time, determine whether mercury levels increased with age of the fish (see Table 1).

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TABLE 1

MERCURY LEVELS IN IDAHO CATFISH AND BASS (in ppm)

IDAHO CATFISH (Ictalurus punctatis)

	A. Walters Ferry		B. Brownlee Reservoir	
N	Age	Hg (ppm)	Age	Hg (ppm)
1	5	0.15	6	0.35
2	8	0.24	7	0.35
3	4	0.25	9	0.35
4	8	0.25	8	0.40
5	7	0.30	3	0.45
6	4	0.31	6	0.46
7	6	0.31	7	0.47
8	7	0.31	8	0.47
9	8	0.31	7	0.49
10	5	0.32	7	0.50
11	4	0.33	8	0.50
12	5	0.33	8	0.52
13	6	0.33	6	0.53
14	4	0.35	8	0.53
15	5	0.36	8	0.58
16	4	0.37	8	0.58
17	5	0.42	5	0.60
18	6	0.42	7	0.60
19	5	0.43	6	0.64
20	5	0.48	6	0.67
$\bar{X}$	5.6	0.33	6.9	0.50
Range		0.15–0.45		0.35–0.67
S.D.		0.08		0.09

IDAHO BASS (Micropterus dolomeieu)

	A. 8 mile below Hells Canyon Dam on Snake River		B. Brownlee Reservoir	
N	Age	Hg (ppm)	Age	Hg (ppm)
1	3	0.20	4	0.49
2	2	0.40	2	0.50
3	2	0.48	2	0.50
4	2	0.51	3	0.50
5	2	0.60	4	0.50
6	3	0.60	2	0.51
7	3	0.61	3	0.51
8	3	0.62	3	0.53
9	3	0.62	4	0.53
10	3	0.71	2	0.54
11	2	0.85	3	0.57
12	3	1.00	3	0.59
13	3	1.10	4	0.76
14	3	1.10	3	0.82
15	4	1.15	3	0.85
16	2	1.20	2	0.90
17	3	1.24	4	0.90
18	3	1.30	3	0.99
$\bar{X}$	2.72	0.79	3.0	0.64
Range		0.20–1.30		0.49–0.94
S.D.		0.33		0.18

MATERIALS AND METHODS

Eighteen bass and twenty catfish were collected immediately behind the dam in Brownlee Reservoir. Brownlee is the first large impoundment at the head of the Hells Canyon power complex. The Snake River flowing into this dam has passed through several hundred miles of agricultural land subject to runoff as well as passing through several areas where mercury is found naturally. After leaving Brownlee the water immediately flows into the backwaters of the next dam, Oxbow, and from there into Hells Canyon Dam impoundment. The total complex is approximately ninety miles long and it acts as a settling basin and after passing through the entire length, it was assumed that the water leaving the system would be relatively free of contaminants.

Eighteen bass were collected eight miles below the Hells Canyon Dams in the free flowing portion of the river and also catfish were collected one hundred and twenty miles up the river from the Brownlee Dam.

A five gram sample of flesh was taken from the dorsal area immediately behind the head. Scale samples for aging were taken from the bass on the left side at the bottom of the dorsal fin. The pectoral spine was removed for sectioning and aging from each catfish.

Analytical Procedures

In each case, a one gram sample was digested by nitric and sulfuric acid using the A.O.A.C. method and equipment (HOROWITZ, 1970). Digests were analyzed using the Coleman 50.

RESULTS AND DISCUSSION

From Table 2 it can be seen that our results in this study corroborate the findings of the other investigators mentioned above in the case of bass alone; not so with the catfish studied. With the bass, for example, there was an increase in mercury concentration from 0.59 ppm to 0.72 ppm between the ages of two and four years in the impounded waters and from 0.67 ppm to 1.15 ppm for the same age period in the free flowing waters. Also there was a small increase in the mean values of from 0.65 to 0.79 ppm between the former to the latter group. This condition was not apparent; however, in the case of catfish, where both patterns with respect to age and habitat, if anything, seemed to be reversed. In all cases, however, except for catfish in the free flowing waters, the mean levels for mercury concentration set by the F.D.A. (0.50 ppm) was exceeded. On this basis, these results would seem to be of some concern to anglers.

TABLE 2

BASS BY AGE GROUPS

Brownlee Dam			8 mile below Dam		
Age	N	Mean Hg (ppm)	Age	N	Mean Hg (ppm)
2	3	0.59	2	6	0.67
3	8	0.66	3	11	0.83
4	3	0.72	4	1	1.15
$\bar{X}$ 2.9		0.65	2.72		0.79

CATFISH BY AGE GROUPS

Brownlee Dam			Walters Ferry		
Age	N	Mean Hg (ppm)	Age	N	Mean Hg (ppm)
3	1	0.45	3	-	—
4	-	-	4	5	0.32
5	1	0.60	5	7	0.36
6	5	0.53	6	3	0.35
7	5	0.48	7	2	0.31
8	7	0.51	8	3	0.27
9	1	0.35	9	-	—
$\bar{X}$ 2.9		0.50	5.6		0.33

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