

MERCURY DYNAMICS IN SOUTH DAKOTA WALLEYE: WATER LEVEL FLUCTUATIONS, SEASONAL VARIATION AND REPRODUCTIVE CONDITION

Trevor M. Selch, Montana Fish, Wildlife, and Parks, 1420 East 6th Ave., Helena, MT 59620
tselch@mt.gov

Steven R. Chipps, U.S. Geological Survey, South Dakota Cooperative Fish and Wildlife Research Unit, Box 2140B, SNP 138, South Dakota State University, Brookings, SD 57007

Consecutive years of high precipitation during the mid-1990s caused dramatic surface area expansions in many glacial lakes and wetlands of eastern South Dakota. In several of these lakes, walleyes (*Sander vitreus*) and other game fishes were found to contain elevated mercury (Hg) concentrations ($>1 \mu\text{g/g}$). Using data from recent habitat surveys and state-wide Hg sampling, we explored relationships between physicochemical attributes of lakes and Hg concentrations in walleye. Lakes that experienced the greatest change in surface area (Δha) between wet (1999-2001) and dry (1975-1979) years contained walleye with the highest Hg concentrations. We collected walleye from two high Hg lake to determine if Hg concentrations fluctuate seasonally. Tissue Hg concentrations of walleye adjusted for length were significantly higher in the spring in both Bitter (42.9 %; $P < 0.008$) and Twin Lakes

(67.6 %; $P < 0.017$) compared to summer and fall samples. To evaluate factors affecting walleye reproduction, we compared reproductive characteristics between a low (Pelican Lake, mean Hg = 0.05 $\mu\text{g/g}$) and high Hg (Bitter Lake, mean Hg = 0.99 $\mu\text{g/g}$) lake. Mean monthly blood plasma concentrations of estradiol-17 β and testosterone for both male and female walleyes were suppressed in fish from Bitter lake (high Hg) compared to Pelican lake (low Hg). To evaluate the influence of Hg on fertilization success, we conducted laboratory experiments to quantify effects of extrinsic (i.e., waterborne MeHg concentration) and intrinsic (i.e., Hg concentration of parental males) factors associated with Hg contamination. Fertilization success decreased significantly with increased waterborne MeHg concentration ($F_{[4,90]} = 70.5$, $P < 0.001$) and ranged from 28 percent at 1 mg/L to 65 percent at 0 mg/L. This study suggests that top-level predators in naturally contaminated lakes may be at risk for impaired reproductive success. Closely monitoring the relationship between walleye Hg concentration and recruitment dynamics would provide further insight into the toxicological effects of Hg on the reproductive success of walleyes.