

Lake Wisconsin Whole Panfish Mercury 2012
Wisconsin Department of Natural Resources Fisheries Management
February 2013

Two species of panfish were collected from Lake Wisconsin at two different locations over two days in May 2012. Mercury concentrations were quantified for whole fish and log₁₀ transformed to ensure normality. An analysis of covariance (SAS 9.3) was then performed to determine relationships between mercury concentration, fish length, and fish species.

Findings - Our analysis suggests, based on the few samples collected, that mercury concentrations are related to fish length. After adjusting for length, we found that concentrations of mercury differ between collection locations (see Appendix A for more detailed information). No confounding interactions between site, species, and length were found.

Figure 1 displays mercury concentrations (top) and the length (bottom) of fish collected at each location. Mercury concentrations in these fish at both locations were, as expected, very low (<0.05 ppm), though bluegill collected from the Merrimac railroad bridge area (RR) tended to be longer than those collected from Grubers Grove (GG).

Figure 2 shows the relationship between mercury concentration and length in all fish. Mercury concentrations were higher in fish collected at GG, although the reason for this cannot be determined from this study and may be due to one or more factors which were not sampled (e.g. differences in food energy conversion, diet, growth rates, mercury exposure, and/or methylation rates).

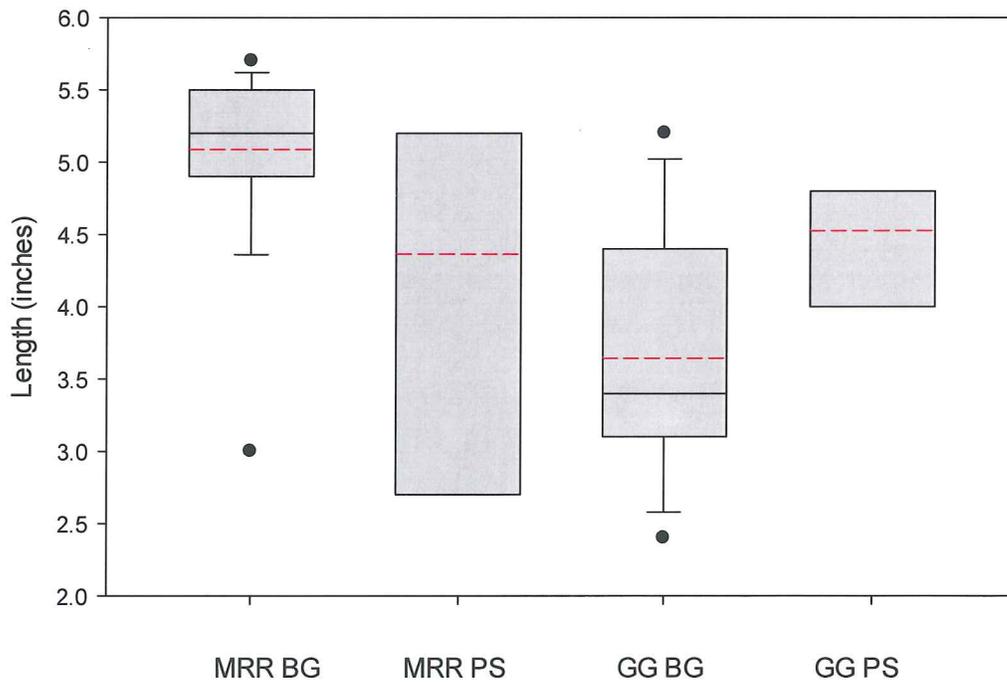
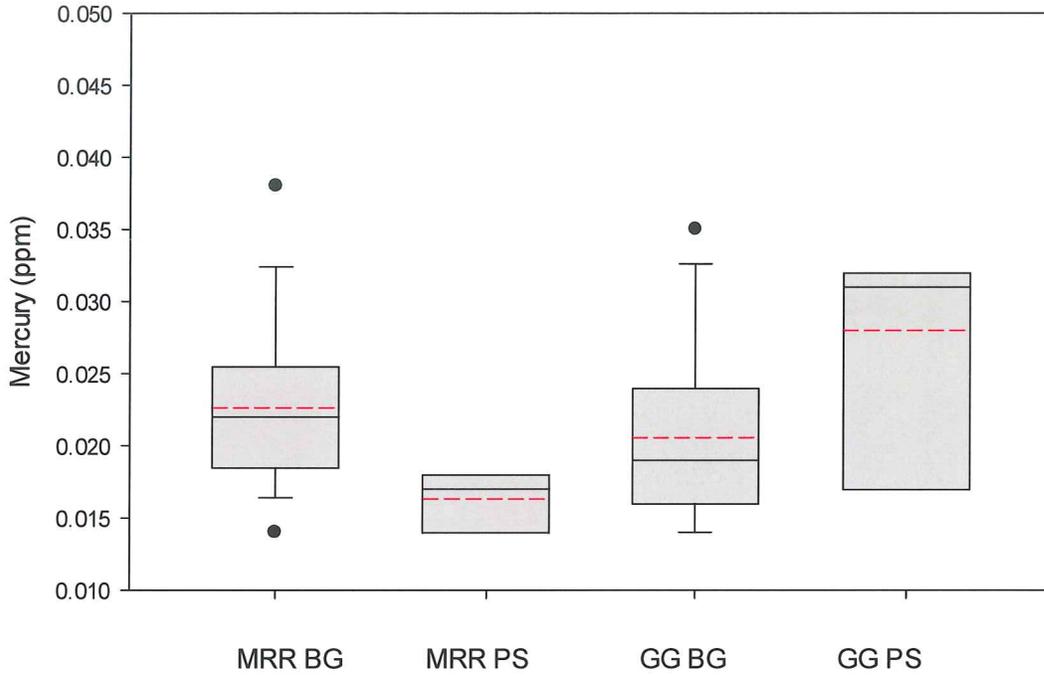
The statistical analysis suggests that mercury concentrations were higher in the fish collected from GG but this could be due to a variety of factors that can't be determined from this one time sampling (e.g. differences in food energy conversion, diet, growth rates, methylation rates, and/or mercury concentrations).

Mercury concentrations in all fish sampled did not differ between the two species sampled and were consistent with the range of concentrations found in other panfish of similar size collected throughout the state between 1990 and 2011 (2 to 6" total length, Figure 3).

Although mercury concentrations in these panfish were all low (<0.05 ppm), the statistical analysis suggests that mercury concentrations were higher in the samples collected from Grubers Grove Bay compared to the railroad bridge site. Determining the reason for this difference is beyond the scope of this onetime sampling but could be due to several factors, such as differences in diet, growth rates, methylation rates, or mercury concentrations.

Figure 1. Box Plots percentile values (5%, 25%, 50%, 75%, 95%), outliers, and mean (red) mercury and length.

Lake Wi Panfish (Whole Fish) Samples 2012 - Mercury and Length



MRR = Merrimac RR Bridge
GG = Gruber's Grove

BG = Bluegill
PS = Pumpkinseed

Figure 2. Mercury concentration (ppm) in whole BG and PS from Merrimac RR Bridge (RR) and Grubers Grove (GG) 2012 versus length (inches).

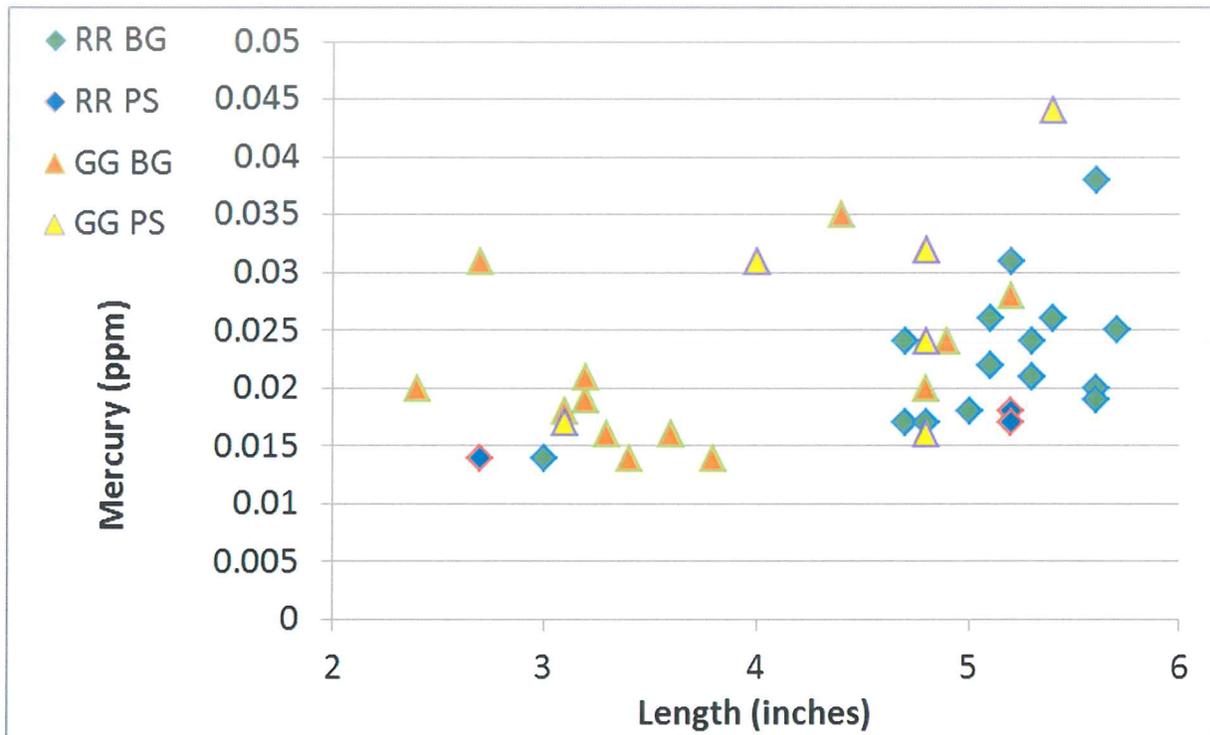
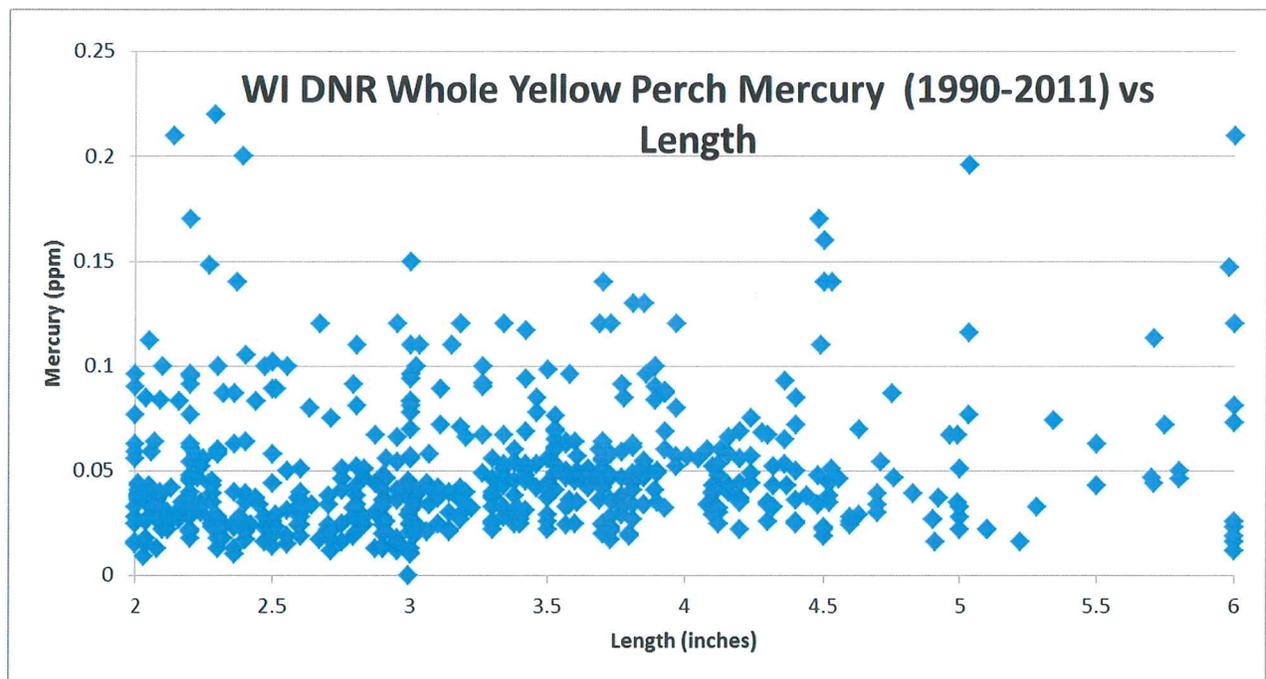


Figure 3. Mercury concentrations in 2" to 6" Yellow Perch (whole fish) for samples collected statewide 1990-2011.



Appendix A.

The SAS System

The GLM Procedure

Class Level Information

Class	Levels	Values
Site	2	GG RR
Species	2	BG PS

Number of Observations Read	42
Number of Observations Used	42

The GLM Procedure

Dependent Variable: Log10Hg

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	0.20787574	0.06929191	5.80	0.0023
Error	38	0.45417038	0.01195185		
Corrected Total	41	0.66204612			

R-Square	Coeff Var	Root MSE	Log10Hg Mean
0.313990	-6.547406	0.109325	-1.669738

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Site	1	0.00204135	0.00204135	0.17	0.6817
Species	1	0.00935882	0.00935882	0.78	0.3818
Inches	1	0.19647557	0.19647557	16.44	0.0002

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Site	1	0.07162304	0.07162304	5.99	0.0191
Species	1	0.00050367	0.00050367	0.04	0.8384
Inches	1	0.19647557	0.19647557	16.44	0.0002