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Executive Summary

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Analysis of Fin Clips: Evaluation as a Non-lethal Method for Monitoring Mercury in Fish

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EXECUTIVE SUMMARY

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Title of Project: Analysis of Fin Clips: Evaluation as a Non-lethal Method for Monitoring Mercury in Fish

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Research Category: Program Interest Area I.B. (Mercury in Wisconsin)
Environmental Monitoring of Pollutants (Biomonitoring)

Project Period: May 15, 2003 – February 15, 2005

Objective of Research: To evaluate the analysis of mercury in fin clips as a nonlethal approach for surveying or monitoring mercury in game fish.

Summary of Results and Accomplishments:

Consumption of fish is the principal pathway of human exposure to methylmercury, a toxic compound affecting the quality of fishery resources in much of the northern Great Lakes Region. Wisconsin and other states routinely sample and analyze recreational fishes for mercury. Existing approaches for monitoring mercury in sport fish involve the dissection and subsequent analysis of axial muscle tissue or edible filets, a process requiring the removal of analyzed fish from the sampled population. Alternative approaches for non-lethal, non-invasive sampling for monitoring mercury in game fishes are desirable. We determined mercury in pelvic fins of two regionally important game fishes, northern pike (*Esox lucius*) and walleye (*Sander vitreus*), and statistically evaluated fin tissue as a bioindicator of mercury concentrations in the edible flesh of these fishes. The analysis of fin tissue could provide a non-lethal approach for surveying or monitoring mercury in game fish.

Mercury concentrations in pelvic fins were positively correlated with those in axial muscle tissue of northern pike and walleye. Nearly 100% of the mercury in the pelvic fin was present as methylmercury. Concentrations of methylmercury and total mercury in the pelvic fins were about 4% of the concentrations of total mercury in the filet. There was a small, but statistically significant difference between northern pike and walleye in the amount of methylmercury in the pelvic fins relative to that in the filet; there was no statistical difference between the two species in the amount of total mercury in the fin

relative to that in the filet.
Pelvic fin mercury was not consistently predictive of filet total mercury within a given lake (coefficient of determination (r^2) varied between 0.01 and 0.95 in 16 lakes). However, combining the data from all lakes resulted in a linear relationship with an r^2 greater than 0.65. Fin mercury concentrations less than 150 ng g^{-1} dry weight were used for additional analysis and comparison as fin-filet relations for both northern pike and walleye were fairly linear in this range.

The fin clip technique shows greater promise in identifying the position of a lake within the regional continuum of mercury concentrations, rather than for evaluation of within-lake variation in fish mercury content. We present examples of the potential use of the fin clip technique in estimating the fin mercury concentration that represents the upper bound of the 95% confidence interval of various mercury advisory limits. For example, our analysis indicates that pelvic fin mercury concentrations exceeding approximately 27 ng g^{-1} mercury (dry weight) are indicative of filet concentrations in excess of a consumption advisory guideline of 0.050 ppm wet weight.

Similarity of the results of the analyses of total mercury and methylmercury implies that the simpler and more cost-effective total mercury analysis may be the best method for utilizing the fin clip technique for fisheries managers. The technique may be incorporated as part of a routine sampling strategy, with rapid sample collection and minimal handling or processing concerns beyond wearing clean gloves and rinsing the fin with lake or tap water. However, prior to using this approach on a wide scale or with other species, the relation between fin and filet mercury concentrations should be established for a particular species of fish within a specific region as this relationship may be different for the same species among regions or for different species within the same region.

Future Directions and Activities: We plan on submitting this data, along with data on fin clip analyses from other geographic positions (Arctic Alaska, New England, and the Upper Midwest) as a manuscript to a relevant journal within the next 2-3 months. We will continue to add to our growing fin clip database as new samples are collected from future studies.