Indicator: Mercury in Lake St. Clair Walleye

Background

In 1969, the Ontario Water Resources Commission (the predecessor of the Ontario Ministry of the Environment) discovered elevated levels of mercury in sediments of the St. Clair River. Follow-up monitoring of mercury in fish by government and university scientists found sufficient mercury contamination to close the fishery from southern Lake Huron to Lake Erie in 1970. The St. Clair commercial fisheries were substantial, providing about 40 small family companies with $1-2 million worth of fish per year. This became known as the "Mercury Crisis of 1970."

Figure 1. A 14-pound walleye caught in the Detroit River (Photo credit: Jim Barta).

The industry responsible for this contamination was the Dow Chemical Chlor-Alkali Plant in Sarnia, Ontario. Since 1949, Dow Chemical had been operating a mercury cell plant in Sarnia (a second plant came on line in 1965) for production of chlorine and caustic soda. From their production process, mercury was being discharged into the river and contaminating the fishery.

Mercury is a naturally occurring metal, familiar to most people through the use of thermometers. It is used in some industrial processes and in the manufacture of some types of electrical apparatus. At one time, mercury was widely used as an antifouling agent in paints and as a controller of fungal diseases of seeds, flower bulbs, and other vegetation. It is still used as an antimicrobial agent.

Mercury is also toxic. It is found in the environment in different chemical and physical forms, the most toxic being methylmercury. In its elemental form, mercury is not regarded as a major contaminant in water because it is almost completely insoluble in water. However, elemental mercury in sediments can be transformed by microorganisms into a form which is much more water soluble, biologically mobile, and toxic than other forms. Certain fishes have been found to accumulate mercury in their tissues at concentrations 5,000 to 50,000 times greater than in surrounding waters.

Status and Trends

Since 1970, Ontario Ministry of the Environment has systematically monitored mercury in 45 cm walleye using standard sampling and analytical techniques (Figure 1). In 1970, mercury in Lake St. Clair walleye was approximately 2.3 mg/kg. That same year Dow Chemical of Canada was directed by the Ontario Water Resources Commission to

install treatment facilities to eliminate mercury discharges to the St. Clair River. Later, Dow Chemical voluntarily shut down its mercury cell plants in Sarnia and Thunder Bay, Ontario (Hartig 1983). Another mercury cell plant that discharged to the Detroit River in Wyandotte, Michigan was also shut down in 1972.

Authorities estimated that the effluent from the Sarnia plants ran as high as 50 mg/L at times, amounting to a release of approximately 91 metric tons of mercury into the St. Clair River, which flowed downstream to contaminate Lake St. Clair, the Detroit River and Lakes Erie and Ontario. Since these actions to stop the inputs of mercury into the St. Clair River, the mercury content in Lake St. Clair walleye has decreased more than 80%; similar reductions have occurred in other fish species (Figure 2).

A 1999 water and sediment study revealed that the current mercury distribution was quite even throughout the Detroit River, instead of the historic pockets of high concentration (Kreis et al. 2001). Mercury concentrations found in Detroit River fish were slightly lower than in the same species from Lake St. Clair. However, health advisories remain in effect for certain sizes of some fish species from both Lake St. Clair and the Detroit River. Today, the primary source of mercury is contaminated sediment from historic discharges (Michigan Department of Natural Resources and Ontario Ministry of the Environment 1991) and atmospheric loadings.

Management Next Steps

Control of mercury at its source is the primary imperative for action. The Canada-U.S. Great Lakes Water Quality Agreement calls for zero discharge of persistent bioaccumulative toxic substances such as mercury. Priority should be given to reducing loadings from active sources such as power plants and incinerators, and to remediating mercury-contaminated sediment hot spots throughout the corridor.

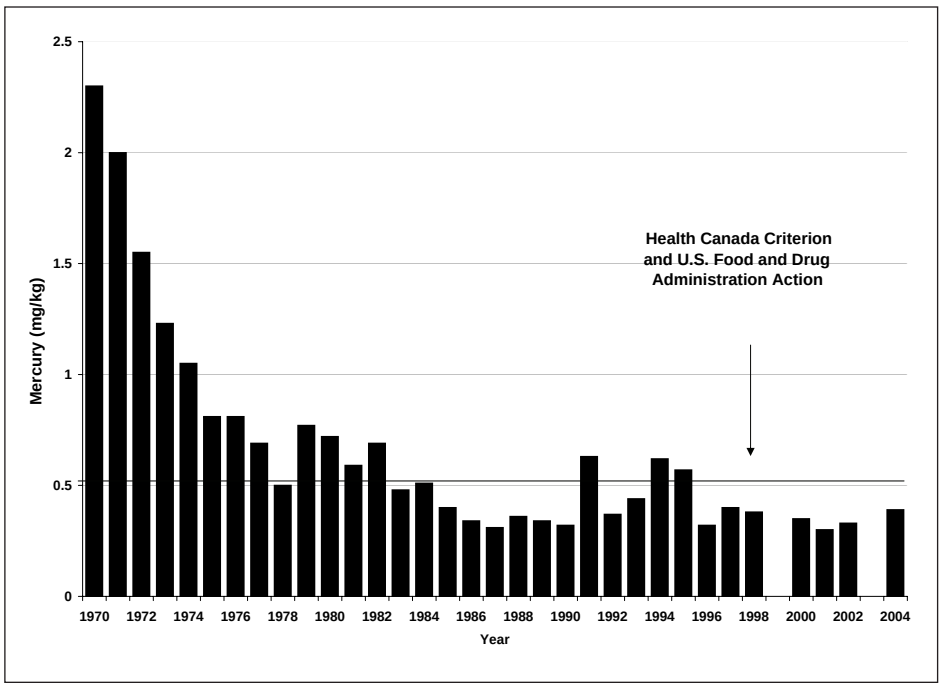

Figure 2. The concentration of mercury in 45 cm walleye in Lake St. Clair, 1970-2004 (data collected by Ontario Ministry of the Environment).

Research/Monitoring Needs

Mercury monitoring in 45 cm walleye should be continued. Annual mercury loadings from active sources should be made readily available to policymakers and to the public. Sources-fate-transport-effects modeling should be a priority to evaluate further remediation options and make midcourse corrections sufficient to remove health advisories on fish from the St. Clair River, Lake St. Clair, Detroit River, and Lake Erie.

References

Hartig, J.H. 1983. Lake St. Clair: Since the Mercury Crisis. *Water Spectrum* 15(1):18-25.

Kreis, R.G. Jr., G.D. Haffner, and M. Tomczak. 2001. Contaminants in water and sediments. *State of the Strait: Status and Trends of the Detroit River Ecosystem*. University of Windsor.

Michigan Department of Natural Resources and Ontario Ministry of the Environment. 1991. *Stage 1 Remedial Action Plan for the Detroit River*. Lansing and Sarnia, Ont.

Links for More Information

Ontario Ministry of the Environment: http://www.ene.gov.on.ca/

EPA, St. Clair River Report: http://www.epa.gov/glnpo/aoc/st-clair.html

Global Mercury Assessment; Impacts of Mercury on the Environment: http://www.chem.unep.ch/mercury/Report/Final%20report/chapter5.pdf

State of the Strait Conference; Contaminants in Water and Sediment: http://cronus.uwindsor.ca/units/glier/stateofthestrait/main.nsf/1fe8a6f51f92512185256a000074dc22/d3f57482f4955c9085256b430044ff8d!OpenDocument

2004 Michigan Family Fish Consumption Guide: http://www.michigan.gov/documents/FishAdvisory03_67354_7.pdf

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