Rising mercury levels in Ontario fish could have severe health, economic consequences

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Fish such as the northern pike, pictured above, are popular among anglers and play an important role in tourism. Credit: Per Verdonk via flickr

Mercury levels in Ontario fish are on the rise and if that trend continues it will have considerable health and economic consequences for Ontario in the coming decades, says a new University of Toronto study.

"Fish mercury levels actually declined during the 1970s and 1980s, but mercury levels in walleye and pike increased between 1995 and 2011," Professor George Arhonditsis says.

"If levels continue to rise it could pose significant health risks to both the fish and the people consuming them."

Authored by a team of researchers including U of T Scarborough's Arhonditsis, Dr. Nilima Gandhi, and Dr. Satyendra Bhavsar, a research scientist with Ontario's Ministry of the Environment and Climate Change, the study looked at trends in mercury levels found in Ontario Walleye, northern pike and lake trout over the past 15 years while projecting where levels will be in 2050.

Northern Ontario lakes in particular are showing trends of increasing fish mercury levels. If the levels continue to increase at this pace, Walleye at almost all monitored Northern Ontario lakes will suffer sublethal effects including an inability to reproduce.

Walleye, northern pike and lake trout were chosen as subjects because they are a top predatory fish and as a result tend to accumulate higher concentrations of mercury from eating contaminated prey lower in the food chain. The fish are also extremely popular among anglers and contribute significantly to Ontario's commercial, sport fishing and tourism industries, which add $2.2 billion to Ontario's economy annually. Walleye in particular is also a popular fish to eat among First Nations living in Northern Ontario, notes Bhavsar.

A researcher with the Ontario Sport Fish Contaminant Monitoring Program holds a Walleye and Northern Pike.

The study is unique because of the richness of data obtained through the province's long-running Fish Contaminant Monitoring Program. Not only did it cover a large geographical area but more than 200,000 measurements of fish mercury levels were taken across the province, even including remote locations only accessible by plane.

"There's never been a study that tracked changes in fish mercury concentrations over a long period while also projecting levels for the future," says Gandhi.

The findings, which are published in journal *Environmental Science & Technology*, build on a 2014 study by Gandhi, Bhavsar, and Arhonditsis

that found mercury levels in the same fish have been on the rise over the last 15 years.

Mercury is a highly toxic pollutant. It's been shown to disrupt sex hormones in fish while in humans can cause damage to the neurological, immune, genetic, cardiovascular, respiratory and gastrointestinal systems. A fetus and children are particularly vulnerable because mercury can hamper the neurological development of the brain.

The study also looked at the impact rising mercury levels will have on fish consumption advisories. It shows that by 2050 only one per cent to 33 per cent of monitored Ontario lakes may have walleye in which mercury levels could be deemed safe to eat twice a week, which is the recommended serving of fish by Health Canada to maintain a healthy diet.

"Clearly this shows there's a health risk to the people eating these fish, ironically who are doing it for better health," says Gandhi.

Although only about one third of mercury emissions are emitted from human activities, about 60 per cent results from 're-emissions' of mercury stored in soil and oceans from past human activity over the last decades and centuries.

The way in which mercury cycles around in the environment means it can spend a long time as a contaminant once it's emitted, and that any action taken on reductions will only see results after a decade or longer, notes Gandhi.

Mercury emissions in North America have been in decline, especially in Canada where rates fell 90 per cent between 1970 and 2011. North American emissions now represent only about three per cent of human caused global mercury emissions. Global coal burning and mercury

emissions have actually gone up in the last 20 years mostly due to greater industrialization in China and India. Current global emissions of mercury stand at about 2,000 metric tons annually.

"A recent study showed that if dramatic actions were to be taken even the most hopeful estimate shows emissions can realistically only be reduced to about 800 metric tons by 2050. If it's business as usual, emissions will likely increase to 3,400 metric tons annually," says Arhonditsis.

More information: Nilima Gandhi et al. Projecting Fish Mercury Levels in the Province of Ontario, Canada and the Implications for Fish and Human Health, *Environmental Science & Technology* (2015). DOI: 10.1021/acs.est.5b03943

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