Mercury Concentrations in Sediment and Fish Scales of Gator Lake in the Everglades

by
Jennifer E. Jensen

Thesis

submitted in partial fulfillment of the requirements for the Degree of Bachelor of Science from the Center for Environmental Studies at Brown University

May 1994

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ABSTRACT

This study was initiated by Marjorie Winkler of University of Wisconsin-Madison as part of a larger study that she is doing for the Everglades National Park (ENP) on the paleoenvironments of the Florida Everglades. The park district is concerned about the effects of mercury (Hg) contamination in the Everglades on wildlife and on humans who depend upon fish from the area as a source of protein in their diet. The goals of this preliminary study were to: 1) determine any trends in Hg accumulation in the uppermost sediment (0-95.6 cm) of Gator Lake over time, 2) compare the Gator Lake Hg sediment results with other studies in Florida and elsewhere, 3) determine whether fish scales preserved in the core contain traceable levels of Hg and evaluate their possible usefulness as an indicator of bioavailable Hg, and 4) assess the severity of Hg contamination in Gator Lake.

The sediment cores (7 approx. 1 meter cores) were retrieved in February 1993 by Winkler and party. I analyzed the cores for percent organic and percent carbonate by loss-on-ignition (LOI) analysis. I subsampled 0-95.6 cm in 10 cm intervals and extracted fish scales from these samples. Both sediment and fish scale samples were acid digested and then tested for total Hg with atomic absorption spectroscopy at the Water Science Lab, UW-Madison. A sediment sample of the basal organics at 700 cm was radiocarbon dated at 2040 $\pm$80 yr B.P., from which an age model was created assuming a constant sediment deposition rate of 34.3 cm/10^3 yr. However, LOI results suggest that this age model is incorrect for the uppermost meter where more rapid sedimentation seems to have occured. The revised age model estimates 1900 at 85 cm.

The core of Gator Lake used for Hg analysis is homogeneous, organic-rich peat sediment. Percent organic has a mean of 73% in basal strata, increasing in the top meter (103-0 cm) to a mean of 80% with some variability. Percent carbonate is very low in basal sediments (mean 2%), increasing in the top meter (95.6-0 cm) to a mean of 7%. Due to the high degree of methodological uncertainty in the Hg concentration results, only general trends are discussed. Regression analysis in the sediment showed a significant increase in Hg levels towards the surface ($p=.001$). Fish scale Hg concentrations do not correlate with sediment, they peak at 60 cm and then decrease again at the surface.

Hg concentrations in Gator Lake sediment appear to have increased about 120% from pre- to post-Industrial Revolution (post-1900). As Hg contamination is already known to be a problem for wildlife in the Everglades and fishing is popular in the area, this increase should be approached with concern. Similar increases found in remote lakes

in other geographical regions have been attributed to increasing rates of atmospheric Hg deposition due to coal burning, waste incineration, etc. Local sources such as volatilization of stored Hg in peat through hydrological disruptions in the Everglades and the burning of fields by the sugarcane industry may also be contributing. Fish scales do show measurable levels of Hg, but more precise analytical methods must be used to determine their usefulness as an indicator for historical Hg levels.