



Project Summary

Changes in the Zooplankton Community in Response to Reductions in Nutrient Loading to Saginaw Bay (Lake Huron)

Donald C. McNaught, David Griesmer, and Reed Larson

Saginaw Bay (Lake Huron) receives tributary waters from the industrial heartland of Michigan. For 20 years, University scientists have examined its water chemistry, physical characteristics including currents, and the community composition of its biota. This large amount of background information has permitted interpretation of the EPA's efforts to improve water quality in the system by diverting nutrients as phosphorus and nitrogen.

This Project Summary was developed by EPA's Environmental Research Laboratory, Duluth, MN, to announce key findings of the research project that is fully documented in a separate report of the same title (see Project Report ordering information at back).

Introduction

The U.S. Environmental Protection Agency, in an attempt to reduce pollution and maintain the biological integrity of Saginaw Bay (Lake Huron), reduced fluvial inputs of phosphorus by 50% between 1975 and 1978. By 1980 this action had resulted in a 24% decrease in available orthophosphate for phytoplankton growth. This report discusses changes in the zooplankton community of the Bay resulting from these reduced inputs.

Methods

Planktonic crustaceans (cladocerans, copepods) and rotifers were collected during survey cruises on Saginaw Bay, Lake Huron. Approximately 37 stations were sampled at 5 m intervals (1, 5, 10,

15m and bottom), for a total of about 60 samples per cruise. Cruises of 5 days duration occurred each month from April through November 1980.

Samples to be counted for rotifers were collected with an electric pump. Approximately 100 L of water was pumped through a plankton funnel fitted with 54 μm nitex nylon screening. Rotifers were relaxed with carbonated water and preserved in 5 percent buffered formalin.

The crustaceans and rotifers were counted by University of Minnesota technicians, hired and trained by the principal investigator.

Traditional subsampling methods were used. Each concentrated zooplankton sample was adjusted to a constant volume. The sample was then mixed and an aliquot withdrawn with a Hensen-Stemple pipette. The subsample of 10 ml was counted in a gridded dish at 30 to 100x under a Leitz dissecting microscope. This method sufficed for all crustaceans.

Conclusions

The zooplankton community of Saginaw Bay relies on algal and detrital foods. A reduction in phosphorus loading of 50% resulted in significant changes in this community. The crustacean zooplankton were moderately reduced in abundance. Total crustaceans fell from a yearly mean of 155700/m³ in 1974 to 97800/m³ in 1980. The percentage composition of the eutrophic indicator *Bosmina longirostris* remained, however, relatively constant at 38%. A slight indication that populations of the oligotrophic indicator *Diaptomus*

sicilis were increasing in the Bay was presented.

The rotiferan zooplankton responded to nutrient diversion very dramatically. Total rotifers decreased significantly between 1974 and 1980, experiencing approximately a 3-fold reduction. Likewise, predatory rotifers decreased significantly, an indication that one of the apex groups of organisms had responded as predicted to nutrient limitation, in a similar fashion than an apex fish predator would be encouraged by a decrease in toxic substances.

Variations in zooplankton crops in Saginaw Bay within and between years were attributed to variations in the flow of the Saginaw River. Care was taken to account for this fact in attributing a significant improvement in the Bay's water quality to nutrient diversion.

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The complete report, entitled "Changes in the Zooplankton Community in Response to Reductions in Nutrient Loading to Saginaw Bay (Lake Huron)," (Order No. PB 83-252 643; Cost: \$10.00, subject to change) will be available only from:

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