ZOOBENTHOS and MEIOBENTHOS

Communities in Lake Winnipeg

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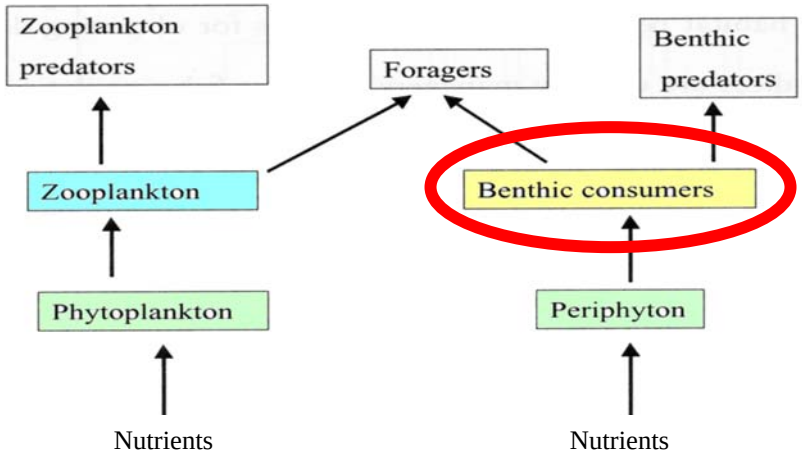
INTRODUCTION

Zoobenthos and meiobenthos constitute essential components of the aquatic food web of lakes. They are the consumers of benthic algae (periphyton) and organic matter in the sediments.

These animals also provide a major component of the food supply of juvenile and adult fish in the lake.



In 2003, oxygen depletion and CO2 and NH3 enrichment were measured at depth (2 to 3 ppm oxygen vs surface levels of 8 to 9 ppm) in the North basin, and was likely associated with the decomposition of algae. In response to this event, abundances of a number of benthic organisms, including worms, molluscs and crustaceans were severely reduced or depleted. **Such events could have serious implications for food web structure.**

OBJECTIVES

- To determine lake-wide densities of major families of zoobenthos in each year (2002, 2003) and in each season (June, August, September-October).
- To examine spatial variability in densities among basins (North, South, Narrows) in Lake Winnipeg in each year surveyed.
- To evaluate temporal patterns by comparing lake-wide densities of major zoobenthic families in mid-summer (August) between years of current surveys (2002, 2003) with 1969.

METHODS

Three seasonal surveys (spring, summer, autumn) were undertaken during each of 2002 and 2003. Approximately 50-55 samples (in duplicate) were collected for intensive analysis of zoobenthos and meiobenthos in each of the 6 surveys.

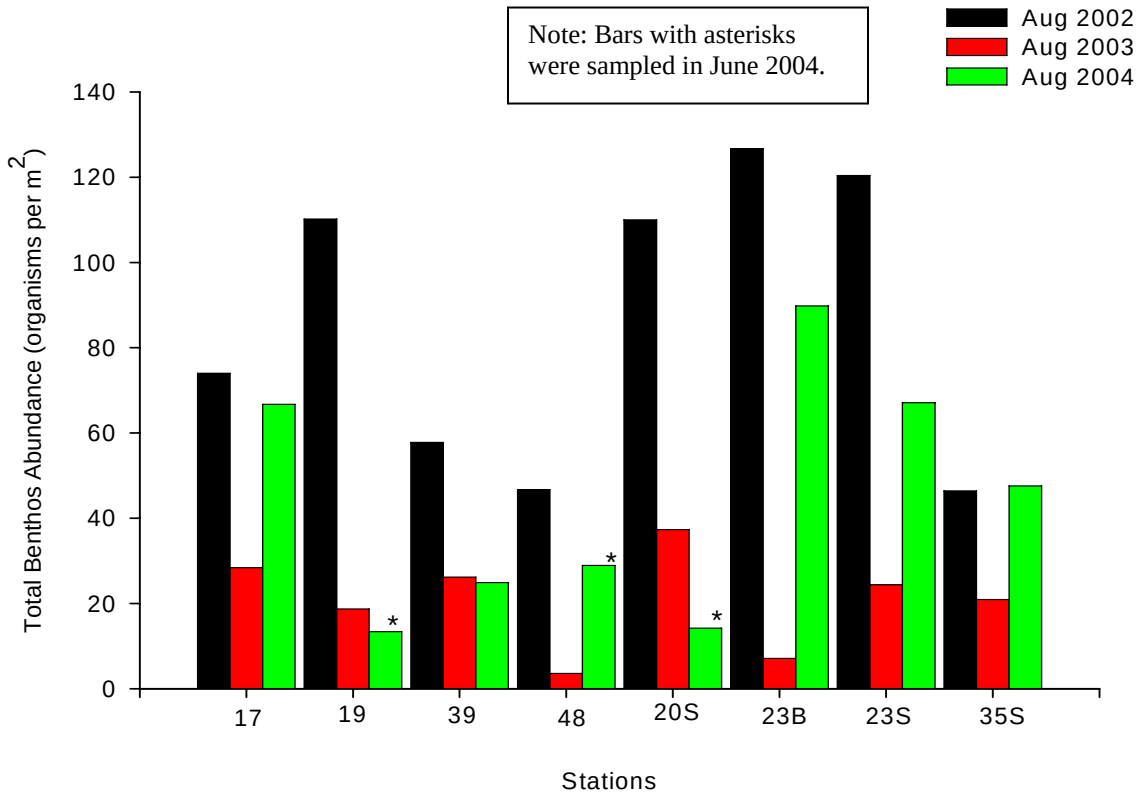
In 2003, zoobenthos samples were collected along transects at 3 river mouths: Red River, Berens River and Bloodvein River, to examine the influence of various riverine inflows on benthic communities.

All samples were collected using a standard Ekman dredge. Zoobenthos samples were sieved through a 200 micron mesh sieve onboard ship. Meiobenthos samples were extracted from a third Ekman dredge sample and immediately frozen for later sieving in the laboratory.

RESULTS

To date, only 2002 samples have been analyzed in detail. However, selected samples from the North basin during a period of hypoxia in a temporary hypolimnion in July - August 2003 were compared with those collected from a similar suite of samples in 2002 and 2004 when hypoxic conditions did not exist.

The figure below shows substantial declines in densities at every station included in the hypolimnetic area during the period of hypoxia. At the majority of these stations, noticeable recovery of zoobenthic community densities was observed in August 2004.



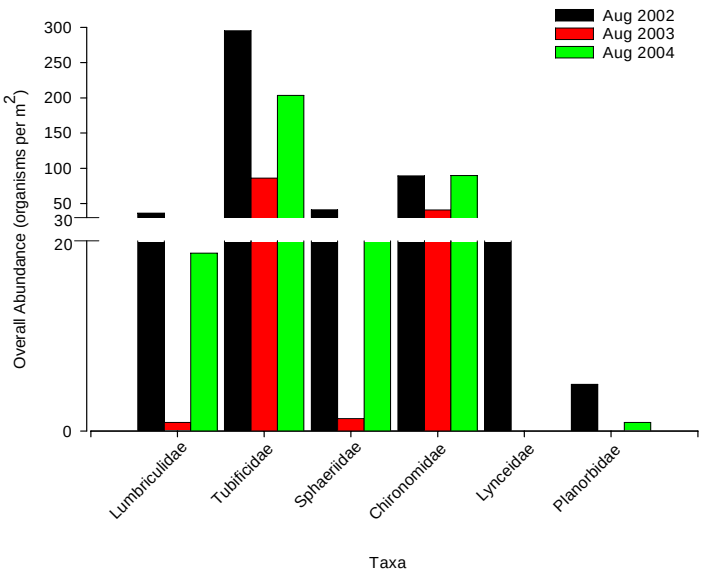
Benthos Abundance, North basin (2002 to 2004)

Specific taxonomic groups of zoobenthic organisms responded differentially to the hypoxic stress.

- Tubificidae (worms) and Chironomidae (midges) were least affected.
- Lumbriculidae (worms), were severely reduced in density in August 2003.
- Among the molluscs, both Sphaeridae (fingernail clams) and Planorbidae (snails) suffered drastic declines.

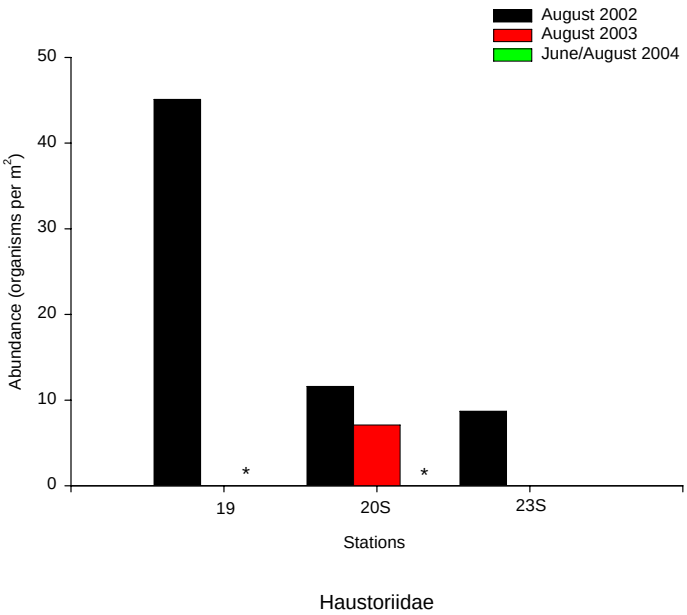
- The abundances of benthic crustaceans, Lynceidae (clam shrimps) and Haustoriidae (amphipods), similarly were greatly depleted.

As with overall densities, the densities of many individual taxonomic groups recovered by August 2004 with some notable exceptions, particularly benthic crustaceans.



Response and Recovery of Major Zoobenthic Groups to Hypoxia (2003)

Diporeia (Amphipoda, Haustoriidae) was particularly negatively affected during the hypoxic conditions in the hypolimnion in 2003, and recovery in 2004 was minimal.



Note: Stations with asterisks were sampled in June 2004 (not sampled in August due to poor weather

Response and Recovery of *Diporeia* to Hypoxia, North Basin (2003, 2004)

FUTURE RESEARCH

Sampling of zoobenthos in subsequent years will be critical to evaluation of the status of these communities as they respond to environmental stresses, particularly continued nutrient loading and hypoxia in the hypolimnion.