Effects of Turbidity on Phytoplankton and Planktivore Abundance in Four Central New York Lakes

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Introduction

- Turbidity (amount of total suspended solids (TSS) in water) is an important factor in aquatic ecosystems that affects the rates of primary productivity and distribution of organisms in the lakes, especially fish.
- This is due to low light penetration as well as low concentrations of dissolved oxygen if the turbidity is a reflection of CDOM and particulate matter in the water column rather than phytoplankton. Therefore, an examination of chlorophyll concentrations can give an indication of whether turbidity is measuring phytoplankton or some other TSS in the water column.
- **In this study we hypothesized that planktivorous fish would be correlated with turbidity and phytoplankton abundance in four Central New York lakes.** If these parameters are significant, that would be evidence of a bottom up effect in the food chain.

Methods

- Two sample sites in four different lakes were sampled over the course of 2 days with similar weather conditions, having had no heavy rainfall immediately prior to sampling.

Figure 1: Sampling sites on all four lakes.
a. Lake Moraine b. Tully Lake c. Otisco Lake d. Sandy Pond

- DEC fish distribution data were obtained for the four lakes. Data were collected using trap nets at each lake.
- A YSI Multiprobe was used to collect turbidity & other relevant data from each sample site at 1 meter depth.
- Sample water was collected from each site for analysis of Chlorophyll *a*.
- Chlorophyll *a* was measured by filtration, extraction in buffered ethanol and fluorometer analysis as a proxy for phytoplankton biomass.
- Regression and ANOVA analyses were performed in order to see if there were significant correlations between turbidity & juvenile planktivores as well as chlorophyll *a* & juvenile planktivores.

Results

Table 1: Chlorophyll a, turbidity, & % juvenile planktivore.

Lake	Chlorophyll *a* (µg/L) Site 1	Chlorophyll *a* (µg/L) Site 2	Turbidity (NTU) Site 1	Turbidity (NTU) Site 2	Juvenile Planktivore
Otisco Lake	20.7	164.0	5.4	10.2	679
Lake Moraine	20.1	30.7	1.9	1.7	649
Sandy Pond	21.4	29.9	3.5	5.1	84
Tully Lake	9.45	11.2	0.2	0.8	524

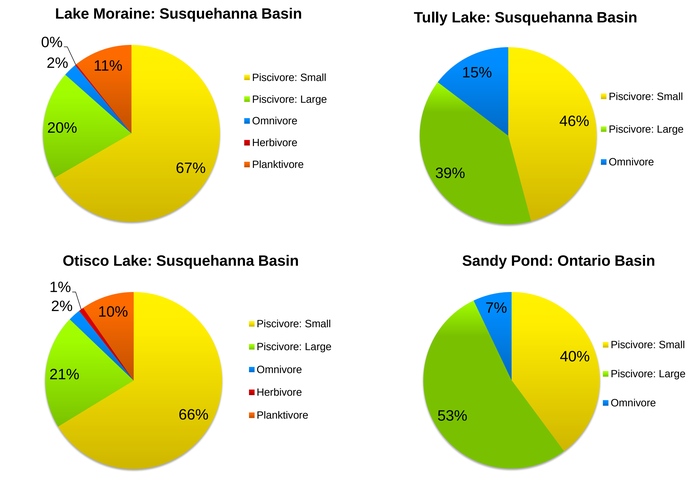
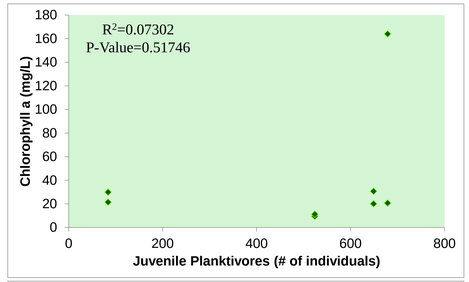
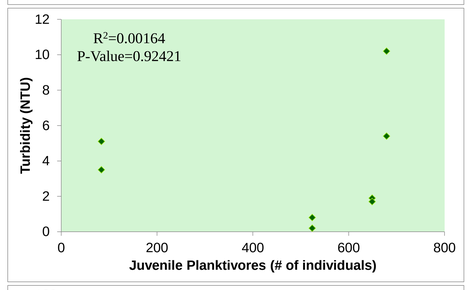


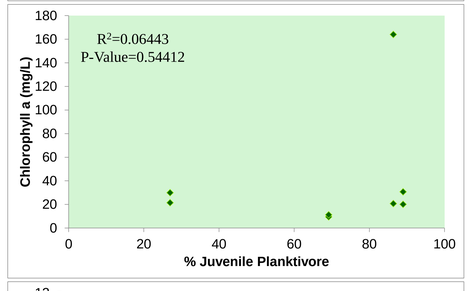
Figure 2: Fish distribution by consumer classification of species for each lake sampled.

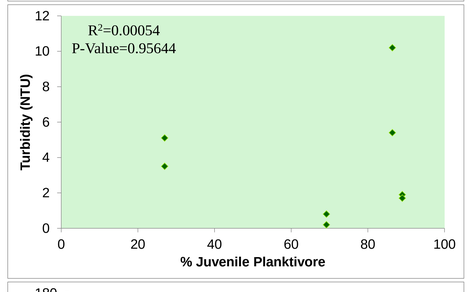
Table 2: Most abundant fish species for each lake sampled.

Lake	Fish Species
Lake Moraine	Bluegill Sunfish White Perch
Tully Lake	Brown Bullhead Bluegill Sunfish Yellow Perch Pumpkinseed Sunfish
Otisco Lake	Bluegill Sunfish White Perch
Sandy Pond	Largemouth Bass Pumpkinseed Sunfish









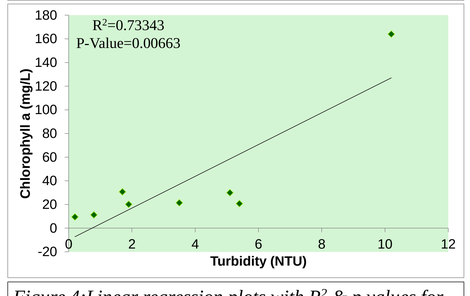


Figure 4:Linear regression plots with R^2 & p values for each parameter comparison.

Discussion

- A strong correlation between turbidity and chlorophyll *a* was found, indicating that phytoplankton are a large part of the turbidity measurement taken and that TSS and CDOM are not the only things suspended in the water column that affect light penetration.
- No mathematical correlation between chlorophyll *a* concentration and turbidity with juvenile fish count could be shown through linear regression and ANOVA analysis.
- This could be the case for several reasons:
  - Small sample size of 4 lakes.
  - Two of the lakes (Otisco Lake & Lake Moraine) were not uniform and had causeways that had different turbidity and chlorophyll *a* measurements on either side of them.
  - Juvenile fish count was estimated from data on adult fish from each lake, ideally juvenile fish data would have been collected using minnow traps or larval nets.
  - Samples collected in Fall would have different chlorophyll A concentrations and turbidity than samples collected during Spring & Summer.

Photos (From left to right & top to bottom) Lake Moraine, sampling Lake Moraine, Otisco Lake &Sampling Otisco Lake.

Literature Cited

Blaber, S. J. M., & Blaber, T. G. (1980). Factors affecting the distribution of juvenile estuarine and inshore fish. *Journal of Fish Biology*, *17*(2), 143-162.

Acknowledgments

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