Chlorophyll \(a\) concentrations in Otsego Lake, summer 2014

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INTRODUCTION

Chlorophyll \(a\) concentrations are monitored annually in Otsego Lake in order to estimate algal mass, an important part of evaluating the lake’s trophic status. Chlorophyll \(a\), the light-sensitive pigment that enables photosynthesis, is found in the dominant algae of Otsego Lake (APHA 2012). Chlorophyll \(a\) concentrations can therefore be used to estimate the relative algal biomass in Otsego Lake (Harman et al. 2002). Due to Otsego Lake’s meso-oligotrophic characteristics, such as low nutrients and low algal standing crops (Godfrey 1977), chlorophyll \(a\) concentrations in Otsego Lake are expected to be relatively low.

Various factors affect chlorophyll \(a\) concentrations in Otsego Lake; a primary influence in algal growth are within the lake’s food web interactions. In 1986, alewives (\textit{Alosa pseudoharengus}) were first documented in Otsego Lake (Foster 1990). These planktivorous fish reduced zooplankton population densities, leading to a significant reduction in algal grazing (Harman et al. 2002). Their predation yielded higher algal standing crops, while reducing transparency and concentrations of hypolimnetic dissolved oxygen. Alewives have not been documented in Otsego Lake in recent years, though the historical impact of alewife on algal standing crops remains relevant (i.e., Best 2015). Walleye (\textit{Sander vitreus}), a popular gamefish, were introduced to Otsego Lake in 2000 (Cornwell 2007) and effectively reduced the alewife population, thereby allowing for the rebound of the zooplankton community (Albright and Best 2015).

Zebra mussels (\textit{Dreissena polymorpha}) are exotic, bi-valve, filter feeders that were first documented in Otsego Lake in 2007 (Waterfield 2009). Widespread by 2010 (Albright and Zaengle 2012), these mussels reduced algal standing crops as a result of their high filtering rate. Both a decrease in chlorophyll \(a\) concentrations and a marked increase in water transparency coincided with the introduction of zebra mussels to Otsego Lake (Waterfield and Albright 2013).

The purpose of this work is to gain a deeper understanding of concentrations of chlorophyll \(a\) throughout the lake. The annual monitoring of chlorophyll \(a\) concentrations in Otsego Lake is part of a continued effort to evaluate its trophic parameters related to nutrient concentrations and food web dynamics.

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METHODS

Chlorophyll \( a \) samples were collected every other week from Otsego Lake at sites TR3-C, TR4-C, and TR5-C (see Figure 1). Composite samples from surface to 20 meters were taken at all three sites using a weighted garden hose. At site TR4-C, the deepest point in the lake, discrete samples from surface to 20 meters were collected at 1 meter intervals using a Kemmerer Sampler. Samples were stored in 125 mL Nalgene\textregistered bottles and kept in a cooler to prevent the chlorophyll \( a \) from degrading.

![Figure 1. Bathymetric map showing sample collection sites for chlorophyll \( a \) analysis in Otsego Lake, summer 2014.](image)

The samples were filtered through a 47mm Whatman\textregistered GF/A Glass Micro Fiber filter using a low-pressure vacuum pump. The filters were then folded in half, patted dry to remove excess water, and placed in a petri dish. Samples were stored in a freezer until further processing.
Each filter was then cut into small pieces in a 15mL grinding tube with approximately 4mL of buffered acetone (90% acetone, 10% MgCO₃). Using a drill with a Teflon pestle drill bit, the filter and solution were ground together and transferred to a 15mL centrifuge tube. More buffered acetone was added to bring each sample to 10mL in volume. After g into centrifuge for 10 minutes at 10,000 X G, the samples were analyzed for chlorophyll \(a\) in a Turner Designs™ TD-700 fluorometer. Chlorophyll \(a\) concentrations were then ascertained using the methods of Arar and Collins (1997).

RESULTS & DISCUSSION

Figure 2 shows the average chlorophyll \(a\) concentrations for site TR4-C from years 2002 to 2014 (excluding 2008 and 2009). Chlorophyll \(a\) concentrations for this summer were lower than last year’s concentrations from the surface to 10 meters. From 10 to 20 meters, concentrations of chlorophyll \(a\) were higher than last year’s.

Figure 3 illustrates chlorophyll \(a\) concentrations throughout the water column from 18 June, 2 July, 14 July, and 29 July 2014 at site TR4-C. Results from composite sampling done on the aforementioned dates at sites TR3-C, TR4-C, and TR5-C can be seen in Figure 4.
Figure 3. Chlorophyll \( a \) concentrations throughout the water column at TR4-C on 18 June, 2 July, 14 July, and 29 July 2014.
CONCLUSION

Data collected in summer 2014 continue to indicate that Otsego Lake displays characteristics of an oligotrophic lake. Chlorophyll $a$ concentrations from composite samples at all three sites averaged $\sim 2 \mu g/L$, a relatively low concentration that is consistent with results from recent years.

REFERENCES


