

Chlorophyll *a* analysis of Otsego Lake, summer 2006

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INTRODUCTION

Various limnological studies of many biotic and abiotic aspects of Otsego Lake are carried out yearly. These ongoing studies are conducted in the hopes of recognizing tribulations in the lake before they become a threat (Harman et al. 1997). Among these studies is the measurement of the vertical distribution of chlorophyll *a* concentrations in the lake.

Chlorophyll *a* is a light sensitive pigment which is used in the process of photosynthesis. Since chlorophyll *a* is found in all types of algae, its presence is used to estimate the biomass of phytoplankton in the lake. The ratio between chlorophyll *a* and biomass is somewhat variable; therefore measurements are not exact (Wetzel 1975). The presence of algae is a major indicator of water quality and trophic status in the lake. The abundance of algae determines the success of other organisms, because they are the base of the food chain in the lake. High algal populations can also negatively affect the transparency and dissolved oxygen contents of the lake. As phytoplankton die, decompose, and sink through the hypolimnion, bacterial respiration takes place, lowering dissolved oxygen contents available to the cold water fisheries (Wetzel 1975). Algal densities are mainly a function of nutrient availability and grazing by zooplankton (Wetzel 1975).

During the summer of 2006, vertical distributions of chlorophyll *a* were monitored as part of an ongoing study since 1997. This study is concurrent with the monitoring of physical and chemical parameters (Albright 2007).

METHODS AND MATERIALS

Water samples were taken weekly from the deepest part of the lake, sample site TR4-C (Figure 1). Water was collected using a Van Dorn Sampler, taking a sample every meter from the surface to twenty meters. The samples were then poured into 125mL Nalgene[®] bottles. The bottles were stored in a dark cooler until arrival at the lab due to the degenerative nature of chlorophyll *a* if it is exposed to heat and/or light.

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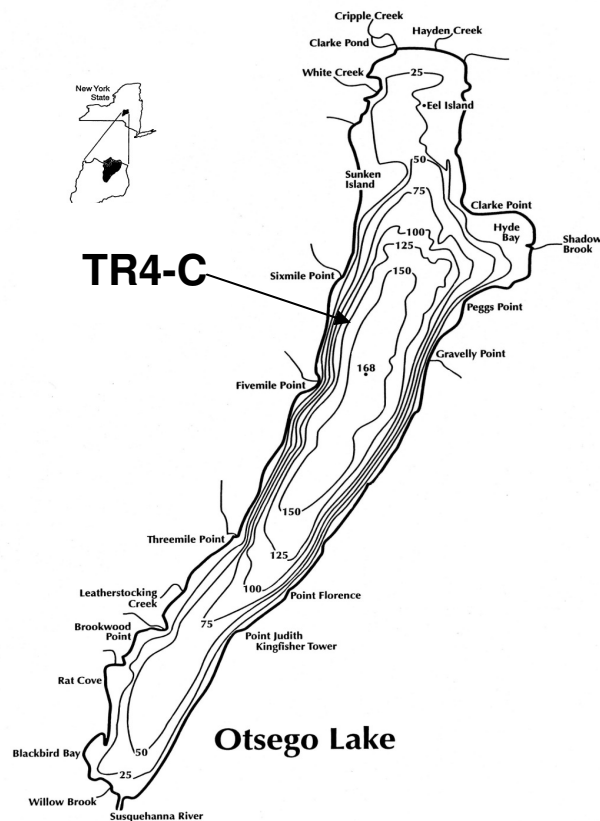


Figure 1. Otsego Lake, Otsego County, New York, showing sample site (TR4-C).

Processing began upon arrival at the lab by running 100 mL of each sample through a GF/A Whatman[®] 47mm Glass Microfiber Filter using a low-pressure vacuum pump. The filters were then folded in half to protect the chlorophyll covered surface, and blotted dry. The edge of each filter that did not come in contact with any chlorophyll was cut off and discarded. Each filter was then placed in a 47mm sterile Millipore[®] Petri dish labeled with site, date, and depth. All dishes were stored at -20°C in a large beaker covered in aluminum foil until processing resumed the next day.

Processing resumed the following day by cutting each filter into pieces using forceps and scissors. The shredded pieces of filter were placed in a 30 mL glass grinding tube combined with approximately 3 to 4 mL of buffered acetone (90% acetone and 10% saturated MgCO₃) and then ground using a power drill equipped with a Teflon pestle drill bit. Once the sample had been ground to a homogenous slurry, it was transferred to a 15mL centrifuge tube and topped off to the 10mL mark using additional buffered acetone solution. Samples were then capped, shaken, covered with aluminum foil and allowed to steep for roughly two hours. An exception to this involved samples collected on 11 August 06, because of equipment unavailability. Those samples were stored for 8 days before final processing.

After two hours passed, the homogenous slurry was centrifuged at 1000g for 10 minutes to settle out any particulate matter. Some of the sample was then poured into a 1cm cuvette and placed in a Turner designs TD-700 Fluorometer, following the methodologies by Arar and Collins (1997), to determine Chlorophyll *a* concentrations.

RESULTS AND DISCUSSION

Figure 2 shows the mean chlorophyll *a* concentrations at each depth for the samples collected from 26 June and 11 August 06. The graph shows +/- 1 standard deviation, which implies the temporal variance throughout the summer months.

Average chlorophyll *a* levels for the summers of 2000 (Durie 2001), 2001 (Wayman 2002), 2002, (Wayman 2003), 2003 (Schmitt 2004), 2004 (Murray 2005), 2005 (Zurmuhlen 2006), and 2006 are shown in Figure 3. Figure 4 shows the average concentrations at each depth sampled over a six year period. Average chlorophyll *a* levels were higher this year than in the past few years. This may indicate a step backward for the lake after algal levels were declining over the past five years. Higher concentrations may have been due to substantially higher than normal rain fall over the summer, including the record rains that occurred at the end of June, which could have lead to higher nutrient concentrations in the lake resulting in more algal blooms throughout the summer.

Figure 5 shows the weekly results of the vertical distribution of Chlorophyll *a* for the summer of 2006. Although results did not seem to be consistent from week to week, readings from depths of less then 10 meters tended to be higher.

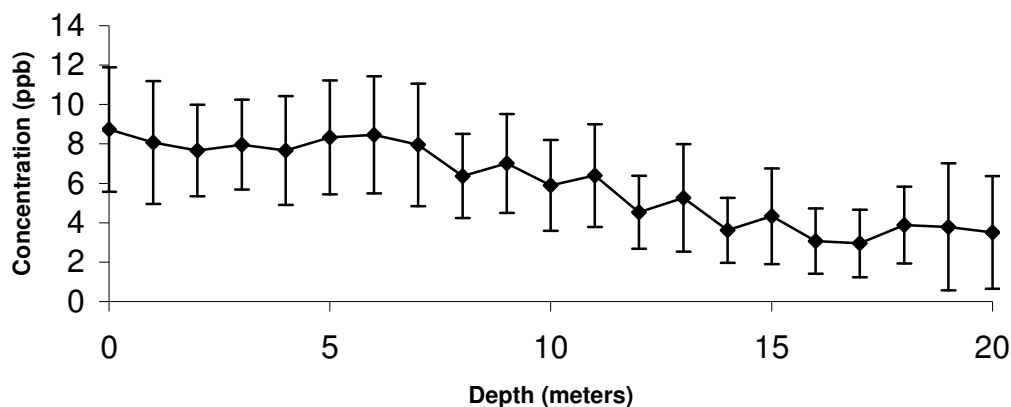


Figure 2. Mean chlorophyll *a* concentrations, surface to 20 meters in Otsego Lake, for summer 2006. The graph shows +/- 1 standard deviation, which implies the temporal variance throughout the summer months.

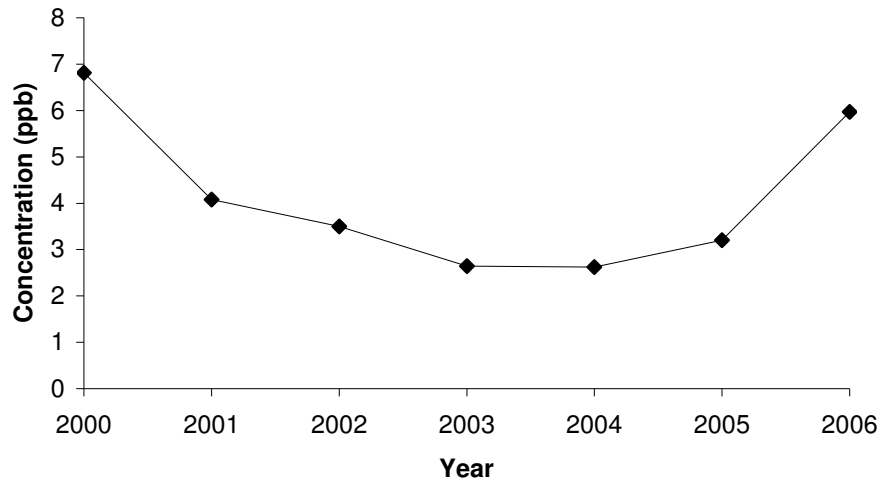


Figure 3. The mean, surface to 20 meters, chlorophyll a concentrations in Otsego Lake for 2000 (Durie 2001), 2001 (Wayman 2002), 2002 (Wayman 2003), 2003 (Schmitt 2004), 2004 (Murray 2005), 2005 (Zurmuhlen 2006) and 2006.

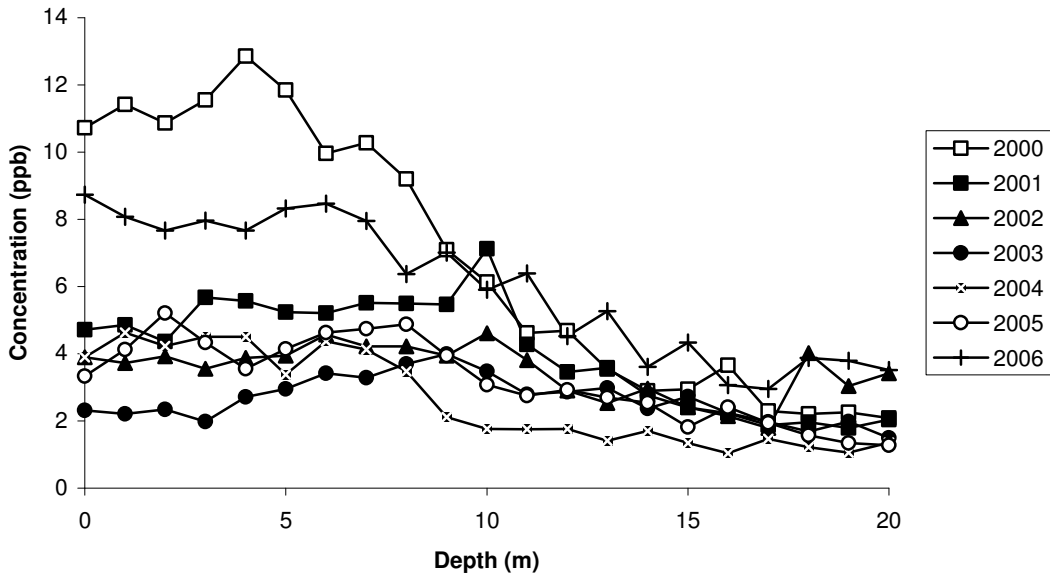


Figure 4. Average concentrations at depths in profile (0-20 meters) in Otsego Lake for 2000 (Durie 2001), 2001 (Wayman 2002), 2002 (Wayman 2003), 2003 (Schmitt 2004), 2004 (Murray 2005), 2005 (Zurmuhlen 2006) and 2006.

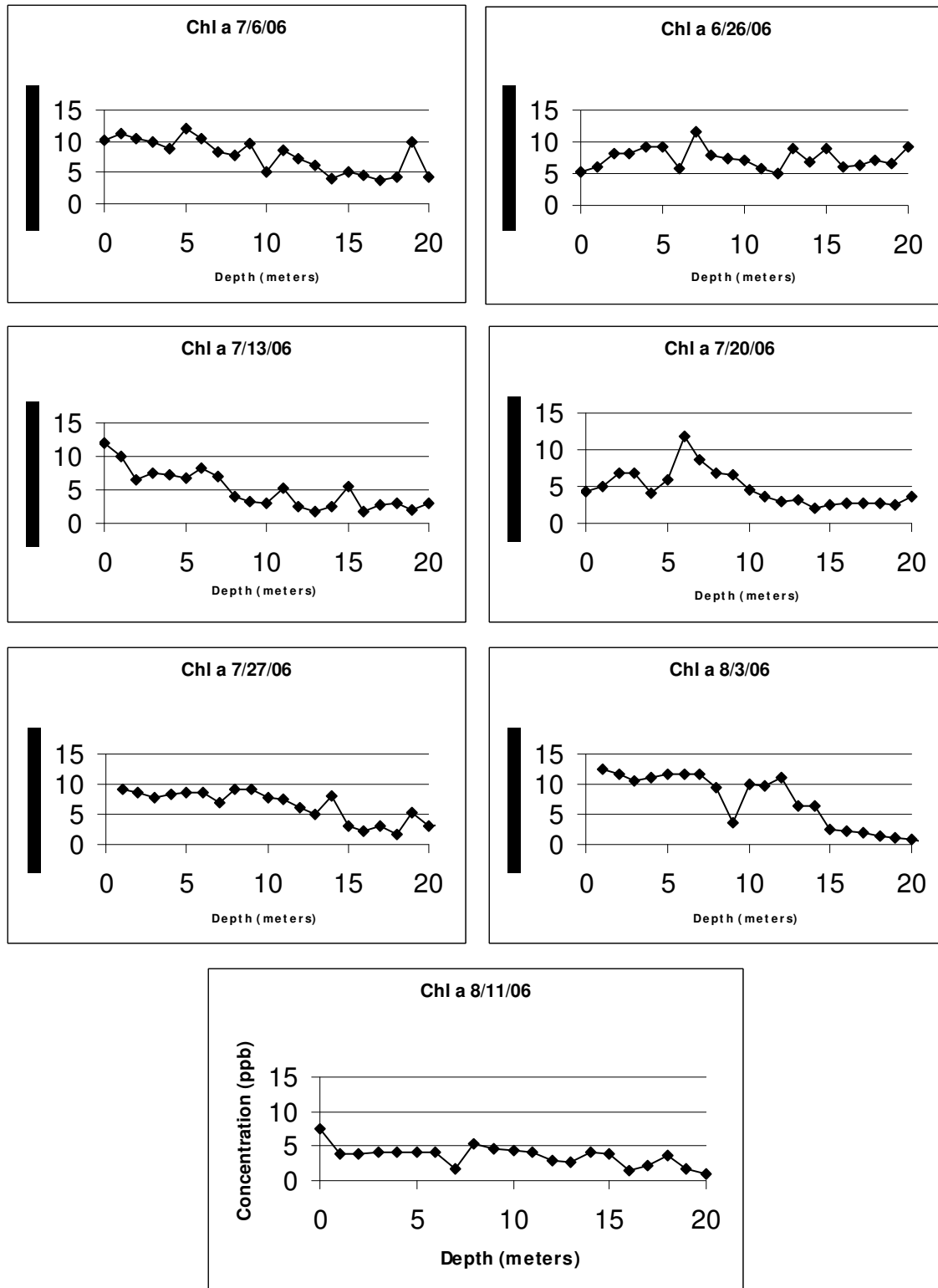


Figure 5. Shows the Vertical distribution of Chlorophyll *a* in Otsego Lake at each depth from 0 to 20 meters from 23 June to 11 August 06.

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