Chlorophyll $a$ analysis of Otsego Lake, summer 2007

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INTRODUCTION

Otsego Lake undergoes limnological studies of several biotic and abiotic aspects yearly (Harman et al 1997). These continuing studies provide knowledge of detriment in the lake before it becomes a threat that could relinquish standard lake management techniques unsuccessful (Harman et al. 1997). Amid these studies are the measurements of chlorophyll $a$ concentrations in the lake.

Chlorophyll $a$ is a light sensitive pigment that is used in the process of photosynthesis. Being that chlorophyll $a$ is present in all types of algae, it is used as an indicator to estimate the biomass of phytoplankton. Algae are the base of the food chain in the lake; their abundance indicates water quality as well as the trophic status of the lake. Monitoring of chlorophyll $a$ concentrations through the 1990s has indicated a shift towards eutrophy in Otsego Lake (Harman et al. 1997). Continuing eutrophication would be exemplified by large algal blooms threatening the overall municipal, aesthetic, and recreational essence of the lake. High algal populations can pose harm for cold water fisheries such as lake trout ($Salvelinus$ $namaycush$) (Wetzel 1975). As Phytoplankton die they lower into the hypolimnion. Decomposition (bacterial respiration) takes place, lowering dissolved oxygen contents needed by lake trout.

Monitoring of chlorophyll $a$ concentrations in the Otsego Lake for the summer of 2007 has been a concurrent study to evaluate the overall chemical and physical parameters (Albright 2007).

METHODS AND MATERIALS

Chlorophyll $a$ samples were acquired weekly from the deepest part of the lake; site (TR4-C) (Figure 1). Using a Van Dorn sampler, samples were collected at 1 meter intervals from the surface to twenty meters. Samples were then transported into 125 mL Nalgene® bottles. Due to chlorophyll $a$’s sensitivity when exposed to heat and/or light, samples were stored in an iced dark cooler until arrival at the lab.

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Upon arrival at the lab, samples were immediately filtered. Using 100 mL of each sample, they were run through a GF/A Whatman ® 47mm Glass Micro fiber Filter using a low pressure vacuum pump. Filters were then folded in half to protect the overall cover surface of chlorophyll and blotted dry. Dry and folded filters were placed in a 47mm sterile Millipore ® Petri dish. Each dish was then foiled, and labeled with site, depth, and date. Dishes were stored at -20°C until processing resumed the next day.

Processing began by cutting each filter into pieces using forceps and scissors. The cut pieces were then placed into a 15 mL glass grinding tube with approximately 3 to 4 mL of buffered acetone (90% acetone and 10% saturated MgCO₃). They were then ground using a power drill equipped with a Teflon pistle drill bit. After each sample was ground into a homogenous slurry they were filled to the 10 mL mark. Each sample was then shaken and placed in the centrifuge for approximately 10 minutes. Some of the sample was then poured into a 1 cm cuvette and placed in a Turner Designs TD-700 Fluorometer. Following the procedures of Arar and Collins (1997), chlorophyll a concentrations were determined.
RESULTS AND DISCUSSION

Figure 2 displays the mean chlorophyll $a$ concentrations at each depth for the samples collected from the 5 July to 7 August 07. The graph shows $\pm 1$ standard error. Figure 3 displays the weekly results of the vertical distribution of chlorophyll $a$ for each sampling date over the summer of 2007. Results from week to week were not consistent and showed no particular pattern pertaining to overall concentrations of chlorophyll $a$.

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), 2006 (Stevens 2007), and 2007 are shown in Figure 4. Figure 5 shows the average concentrations in profile sampled over a six year period. Compared to the results of 2006 (Stevens 2007), there was a steep decrease in overall chlorophyll $a$ concentrations. Prior to 2007 chlorophyll $a$ concentrations were higher above 10 meters and continually decreased past 10 meters. Results this year appear to be somewhat variable and show no extreme decrease in chlorophyll $a$ concentrations. On days such as 26 July 2007, 1 August 2007, and 7 August 2007 the overall majority of high chlorophyll $a$ concentrations peaked at a depth of ten meters. Since the majority of algae remained in this area it may indicate a certain type of algae that prefers subdued lighting.

![Figure 2. Mean chlorophyll $a$ concentrations, surface to 20 meters in Otsego Lake, for summer 2007. The graph shows $\pm$-1 standard deviation, which implies the temporal variance throughout the summer months.](image-url)
Figure 3. The vertical distributions of chlorophyll a, TR4C, Otsego Lake, at each sampling date over summer, 2007.

REFERENCES


