Vertical distribution of chlorophyll $a$ in Otsego Lake, summer 1999

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INTRODUCTION

Limnological analyses of several biotic and abiotic parameters are routinely monitored on Otsego Lake (Harman $et$ $al.$, 1997). Of these factors, algal growth dynamics are perhaps the most important; they are reflective of nutrient levels and grazing by zooplankton and are manifested by low transparency and, ultimately, by depressed deep-water oxygen concentrations. Primary production dictates rates of production throughout the food web, though paralleled rates of oxygen depletion limit available habitat for cold-water species.

Chlorophyll $a$ concentrations (indicative of algal standing crop) in Otsego Lake have been investigated intermittently and with varying levels of intensity. Recent work (from 1996 to present) has involved biweekly photic zone composite samples (Albright, 1997; 1998; 1999; 2000). While this provides an overview of algal densities, information related to vertical distribution is unavailable. This study addresses the vertical distribution of chlorophyll $a$ in Otsego Lake over the summer of 1999.

METHODS

Samples were collected at TR4-C in Otsego Lake (Figure 1) 15, 22, 28 July and 6 and 12 August from the surface to a depth of 20 meters at one meter intervals. During transport, samples were iced and kept dark. Chlorophyll $a$ determinations followed procedures outlined by Welschmeyer (1994). All work was conducted under subdued light to prevent the degradation of chlorophyll. Processing involved passing 100 ml through GF/A Whatman glass microfibre filters in duplicate. Filters were blotted dry, folded in half so that the exposed surface was protected and stored in foil-covered petri dishes at $-20\degree C$ overnight.

The following day, filters were warmed to room temperature and cut into small pieces directly into a grinding tube. Three to four ml of buffered acetone (90% acetone + 10% saturated MgCO$_3$) was added. A pestle on a power drill was used to grind the filter into a homogeneous slurry, which was then transferred to a 20 ml centrifuge tube. After completely rinsing the pestle and grinding tube into the centrifuge tube, buffer acetone was added to bring the volume to 10 ml.

Samples were allowed to steep for 2 hours at $4\degree C$ and were clarified by centrifuging for 10 minutes at 1000 G. Chlorophyll $a$ content was determined using a Turner Design TD-700$^\circledR$ fluorometer.

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Figure 1. Bathymetric map of Otsego Lake showing sampling site (TR4-C).
RESULTS AND DISCUSSION

Because duplicate analysis of the data revealed inconsistencies on samples collected on 15 and 22 July, these data were discarded. It is expected that human error was responsible; though the source of the problem was unclear, the situation seemed to be rectified following 28 July.

Profiles of chlorophyll $a$ from samples collected on 28 July and 6 and 12 August are given in Figures 2-4. Consistent across sampling dates were peaks between 10-12 meters, corresponding with the thermocline. Such metalimnetic peaks have been described before in Otsego (Harman et al., 1997; King, 1998), despite the fact that its depth is typically greater than what is normally considered as being in the photic zone (the surface to the depth at which light is 1% ambient levels). Direct photometric readings indicate this level to typically be 6-10 meters during summer months. Apparently, certain algae taxa are able to do well under relatively low-light conditions; in 1993, Ramsey (Unpubl) found chlorophyll $a$ concentrations over 20 ug/l at 15 m through the summer. More recent work by King (1998) described a situation similar to that found in 1999, though with peaks typically shallower (~8 m) and somewhat less pronounced.

REFERENCES


Figure 2. Chlorophyll $a$ profiles at TR4-C, 28 July.

Figure 3. Chlorophyll $a$ profiles at TR4-C, 6 August.

Figure 4. Chlorophyll $a$ profiles at TR4-C, 12 August.