Cyanobacteria blooms and the transfer of essential fatty acids through the Lake Champlain food web

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Cyanobacteria blooms are a growing concern for many communities, including the ones surrounding Lake Champlain. Blooms detract from enjoyment of the lake and can produce harmful toxins. A less publicized potential problem is the disruption of food web processes. Experiments have found that cyanobacteria-fed zooplankton have poor development and reproduction as a result of insufficient levels of essential fatty acids (EFAs). We hypothesized that cyanobacteria blooms negatively affect EFA levels in fish. To test this hypothesis we collected white perch (n=104), yellow perch (n=120), and seston (particles < 150µm) from four locations in June (pre-bloom), August (bloom), and October (post-bloom). Reports from previous years show that the four collection sites – Missisquoi Bay, Inland Sea, Main Lake, and Malletts Bay – have high, intermediate, low, and lower cyanobacteria bloom densities, respectively. Our preliminary results are from the fatty acid analysis of muscle tissues from Missisquoi Bay and Malletts Bay. Eicosapentaenoic acid (EPA) levels in white perch were statistically different between locations ($p=0.0016$), time points ($p<0.0001$) and showed a time and location interaction ($p=0.0037$). Docosahexaenoic acid (DHA) levels in white perch were statistically different between locations and time points ($p<0.0001$). The interaction between time and location was also statistically significant ($p<0.0001$). Malletts Bay white perch EPA ($p<0.0001$) and DHA ($p<0.0001$) levels changed inversely over time indicating potential conversion of EPA to DHA. This biological process is mainly dependent on diet, suggesting there might have been a food source that supplied increased amounts of EPA. DHA ($p<0.0001$) and EPA ($p=0.0001$) levels both decreased significantly from June to August in Missisquoi Bay white perch. These results support the hypothesis that locations with increased cyanobacteria blooms (Missisquoi Bay) have decreased EFA levels in August compared to areas with lower cyanobacteria density (Malletts Bay).