2017 Phytoplankton Monitoring Project
Schroon Lake, New York
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I. Introduction:

A limited study of the phytoplankton community of Schroon Lake was performed by the lake management firm of Adirondack Ecologists, LLC (***AE***) during the summer of 2017. The study was funded by the Schroon Lake Association (**SLA**).

This was the 6th time that grab samples were collected and microscopically-analyzed on Schroon Lake. Samples were also previously obtained in 2008, 2009, 2013, 2015, and 2016. The principal investigator for all six of the studies was Steven A. LaMere, a Certified Lake Manager, Board Certified Environmental Scientist, and the president of ***AE***.

Since limited historical data on this population existed prior to the initial (2008) research, the primary objective of the studies was to assist in the creation of a long-term scientific database that could be used as a historical "benchmark" to compare the results of future phytoplankton monitoring efforts with. It was hoped that this database, once established, would serve as an educational and informational resource for lakeshore property owners. Understanding the character and function of the phytoplankton community is a key component to understanding the dynamics of any lake system and its food web.

Phytoplankton or algae are microscopic plants that live in the open waters of lakes and ponds and they serve as an important food source for many aquatic organisms. Many of these small plants do not root to the lake bottom or attach themselves to other objects, but rather float freely throughout the water column of the lake. Like rooted, vascular plants, algae produce dissolved oxygen and are nutrient-limited in their growth. Cyanobacteria (blue-green algae) are also organisms that float freely throughout the water column and possess photosynthetic capabilities. Unlike green and yellow-brown algae, however, blue-green algae are not "true" algae, but instead are a type of bacteria.

The abundance and species composition of algae can have significant implications with regard to both the water clarity and quality of any given body of water. Since there is normally a strong statistical correlation between secchi disk transparency (SDT) and algal biomass, with both parameters usually following predictable seasonal patterns, a change in the composition of the phytoplankton community may result in decreased water clarity and increased nutrient loading. These changes, if observed, would likely occur during the summer. The reason for this requires a short explanation.

Algae metabolize more efficiently under higher water temperatures, and since they utilize nutrients directly from the water column for photosynthesis, the higher the nutrient concentrations, the more "productive" algae become. In the spring and fall, when water temperatures are cooler and total phosphorus (TP) levels are lower, algal biomass decreases and SDT increases. As summer progresses and water temperature increases, TP levels normally increase and algal biomass responds accordingly by increasing. As algal biomass increases in the water, the SDT decreases, and this decrease is often very noticeable through visual observation.

II. Methods

Phytoplankton were collected on August 24 via surface water grab sampling at both the north and south lake basin testing sites, and these samples were immediately preserved in Lugol's Solution (approximately 1mL per 100 mL of sample) and shipped to Aquatic Analysts in Friday Harbor, Washington for laboratory analysis.

III. Results & Discussion:

One annual sampling for six years over a ten-year time span is a relatively small dataset in order to study the algae of a particular lake system. The economic realities of securing funding for long-term research projects, however, usually dictate the need for more conservatively-designed, cost-conscious studies than most scientists are ordinarily comfortable performing.

Furthermore, lakes are dynamic, and as such, they "react" to environmental stimuli. Factors like weather and temperature can impart profound changes on the water quality, water clarity, and ecological character of lacustrine environments. Often, the more extreme the weather change or temperature fluctuation is, the more profound the effect on the water body. These changing conditions pose a real challenge to lake scientists trying to search for trends in environmental data over relatively short periods of time.

The following narrative consists of a "summarized interpretation" of the August 2016 phytoplankton data collected on Schroon Lake. All raw data obtained from the laboratory involved in the analysis of these collections is contained within the *Appendix* section of this report. As monitoring of this community continues, a more comprehensive understanding of the lake itself will exist.

Schroon Lake Phytoplankton

Overall (north and south basins combined), a total of twenty-three species of phytoplankton were documented in the 2017 Schroon Lake samples. By comparison, a total of 28, 25, 26, 31 and 30 species were observed in the 2008, 2009, 2013, 2015, and 2016 collections, respectively.

The north basin possessed a total of 18 species, while the south basin collection possessed 15 species. Eight phytoplankton species were unique to the north basin only in 2017, and five species were found exclusively in the south basin.

The most common algal species in the south basin were *Rhodomonas minuta* (59.1%) and *Cryptomonas erosa* (9.1%). In the north basin, *Rhodomonas minuta* (51.4%) and *Cryptomonas erosa* (17.1%) also dominated the collections. *Rhodomonas minuta*, a species which has also been dominant in past collections, is a very widespread alga (probably the most common alga in the U.S.) and it is found under a wide range of ecological conditions. Both

Rhodomonas minuta and *Cryptomonas erosa* are cryptophyte species. Cryptophytes (or cryptomonads) are a small group of unicellular protists that serve as an important source of food for many species of rotifers.

Historically, the two basins have been quite similar in terms of species composition and abundance. Most of the species in the more recent Schroon Lake phytoplankton sample collections are typical of mesotrophic lakes, with a few exceptions. *Sphaerocystis schroeteri*, for example, tends to be more common in oligotrophic waters. Eutrophic algae have also appeared in Schroon Lake phytoplankton collections in years past (e.g., *Anabaena flos-aquae*, *Anabaena planctonica*, *Chroococcus minimus*, *Fragilaria crotonensis* and *Microcystis aeruginosa*).

In the 2017 collections, *Microcystis* was present once again, but only in the north basin and only in relatively small densities (i.e., 0.7% of the overall density). *Aphanothece sp.* (2.3% of the overall density in the south basin and 2.9% of the overall density in the north basin) and *Chroococcus minimus* (6.8% of the overall density in the south basin), both blue-green algal species, were also found in the sample collections.

Microcystis is a eutrophic algal species that does have the potential for producing toxic blooms. However, the abundance of these blue-greens in Schroon Lake has always been much less than the World Health Organization (WHO) "take action" level of 100,000 cells/mL for toxic algae. Only 960 cells/mL of *Microcystis aeruginosa* was found in the 2017 north basin algae collection.

The densities of algae indicate indicate low end mesotrophic conditions. The Trophic State Indices were 35.8 for both the north and south basins.

IV. Conclusions:

The species composition of the Schroon Lake phytoplankton community was, for the most part, normal for a late oligotrophic or an early mesotrophic lake. Algal densities were more indicative of a lake at the low end of mesotrophic conditions. Some blue-green algal species were observed in past and current collections, but their abundances have never been high enough to create a concern for health.

AE recommends that phytoplankton sampling be performed once each year to maintain the existing database. Special attention will be paid to the presence of any potentially problematic algal species in future Schroon Lake phytoplankton collections

APPENDIX

Phytoplankton Sample Analysis

Sample: Schroon Lake
Sample Site: North
Sample Depth:
Sample Date: 24-Aug-17

Total Density (#/mL): 448
Total Biovolume (um^3/mL): 141,857
Trophic State Index: 35.8

	Species	Density #/mL	Density Percent	Biovolume um^3/mL	Biovolume Percent
1	Rhodomonas minuta	230	51.4	4,606	3.2
2	Cryptomonas erosa	77	17.1	39,918	28.1
3	Botryococcus braunii	26	5.7	13,818	9.7
4	Sphaerocystis schroeteri	19	4.3	6,045	4.3
5	Chrysosphaerella sp.	16	3.6	17,272	12.2
6	Aphanothece sp.	13	2.9	1,727	1.2
7	Melosira italica	13	2.9	24,105	17.0
8	Mallomonas sp.	10	2.1	3,646	2.6
9	Achnanthes minutissima	6	1.4	320	0.2
10	Dinobryon sertularia	6	1.4	768	0.5
11	Chlamydomonas sp.	6	1.4	2,079	1.5
12	Glenodinium sp.	6	1.4	4,478	3.2
13	Chromulina sp.	3	0.7	64	0.0
14	Microcystis aeruginosa	3	0.7	7,677	5.4
15	Coscinodiscus sp.	3	0.7	4,798	3.4
16	Fragilaria construens venter	3	0.7	461	0.3
17	Cyclotella comta	3	0.7	7,261	5.1
18	Asterionella formosa	3	0.7	2,815	2.0

Microcystis aeruginosa cells/mL = 960

Phytoplankton Sample Analysis

Sample: Schroon Lake
Sample Site: South
Sample Depth:
Sample Date: 24-Aug-17

Total Density (#/mL): 540
Total Biovolume (um^3/mL): 141,263
Trophic State Index: 35.8

	Species	Density #/mL	Density Percent	Biovolume um^3/mL	Biovolume Percent
1	Rhodomonas minuta	319	59.1	6,381	4.5
2	Cryptomonas erosa	49	9.1	25,526	18.1
3	Chroococcus minimus	37	6.8	3,453	2.4
4	Melosira italica	25	4.5	69,362	49.1
5	Dinobryon sertularia	25	4.5	2,945	2.1
6	Sphaerocystis schroeteri	18	3.4	8,376	5.9
7	Ankistrodesmus falcatus	12	2.3	307	0.2
8	Aphanothece sp.	12	2.3	920	0.7
9	Unidentified flagellate	6	1.1	123	0.1
10	Pediastrum tetras	6	1.1	736	0.5
11	Chrysosphaerella sp.	6	1.1	2,945	2.1
12	Glenodinium sp.	6	1.1	4,295	3.0
13	Cyclotella comta	6	1.1	13,929	9.9
14	Hemidinium sp.	6	1.1	1,841	1.3
15	Chromulina sp.	6	1.1	123	0.1