2019 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 2019. The study was funded by the Schroon Lake Association (**SLA**) and the East Shore Schroon Lake Association (**ESSLA**).

This was the 7th time that grab samples were collected and microscopically-analyzed on Schroon Lake. Samples were also previously obtained in 2008, 2009, 2013, 2015, 2016, and 2017. The principal investigator for all seven 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 19 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 seven years over a twelve-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 2019 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-five species of phytoplankton were documented in the 2019 Schroon Lake samples. By comparison, a total of 28, 25, 26, 31, 30, and 23 species were observed in the 2008, 2009, 2013, 2015, 2016, and 2017 collections, respectively.

The north basin possessed a total of 16 species, while the south basin collection possessed 22 species. Three phytoplankton species were unique to the north basin only in 2019, and nine species were found exclusively in the south basin.

The most common algal species in the north basin were *Rhodomonas minuta* (43.9%) and *Aphanothece sp.* (19.5%). In the south basin, *Aphanothece sp.* (33.9%) and *Rhodomonas minuta* (32.2%) 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. *Rhodo-*

monas minuta is a 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. *Aphanothece* is a blue green that actually predominates in fairly clean water (it is not a toxic blue-green).

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*).

The algal biovolumes indicate low end mesotrophic conditions. The Trophic State Indices were 37.2 and 38.5 for the north and south basin, respectively

IV. Conclusions & Recommendations:

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.

Phytoplankton Sample Analysis

Sample: Schroon Lake
Sample Site: North Basin
Sample Depth:
Sample Date: 19-Aug-19

Total Density (#/mL): 728
Total Biovolume (um^3/mL): 171,682
Trophic State Index: 37.2

	Species	Density #/mL	Density Percent	Biovolume um^3/mL	Biovolume Percent
1	Rhodomonas minuta	320	43.9	6,392	3.7
2	Aphanothece sp.	142	19.5	32,813	19.1
3	Cryptomonas erosa	71	9.8	36,932	21.5
4	Glenodinium sp.	59	8.1	41,430	24.1
5	Sphaerocystis schroeteri	24	3.3	9,115	5.3
6	Chlamydomonas sp.	24	3.3	7,694	4.5
7	Ankistrodesmus falcatus	24	3.3	4,735	2.8
8	Cosmarium sp.	12	1.6	2,486	1.4
9	Dinobryon sertularia	12	1.6	8,523	5.0
10	Oocystis pusilla	6	0.8	959	0.6
11	Synedra rumpens	6	0.8	829	0.5
12	Navicula cryptocephala	6	0.8	1,095	0.6
13	Unidentified flagellate	6	0.8	118	0.1
14	Chroococcus minimus	6	0.8	331	0.2
15	Gymnodinium sp.	6	0.8	15,980	9.3
16	Mallomonas sp.	6	0.8	2,249	1.3

Phytoplankton Sample Analysis

Sample: Schroon Lake
Sample Site: South Basin
Sample Depth:
Sample Date: 19-Aug-19

Total Density (#/mL): 853
Total Biovolume (um^3/mL): 205,801
Trophic State Index: 38.5

	Species	Density #/mL	Density Percent	Biovolume um^3/mL	Biovolume Percent
1	Aphanothece sp.	289	33.9	48,549	23.6
2	Rhodomonas minuta	275	32.2	5,495	2.7
3	Glenodinium sp.	57	6.7	39,794	19.3
4	Cryptomonas erosa	52	6.1	27,098	13.2
5	Ankistrodesmus falcatus	43	5.0	7,142	3.5
6	Dinobryon sertularia	19	2.2	2,274	1.1
7	Chlamydomonas sp.	14	1.7	4,619	2.2
8	Sphaerocystis schroeteri	14	1.7	4,477	2.2
9	Chroococcus minimus	14	1.7	736	0.4
10	Chrysosphaerella sp.	9	1.1	1,705	0.8
11	Oocystis pusilla	9	1.1	2,047	1.0
12	Coscinodiscus sp.	9	1.1	14,212	6.9
13	Cocconeis placentula	5	0.6	2,179	1.1
14	Mallomonas sp.	5	0.6	1,800	0.9
15	Cyclotella comta	5	0.6	10,754	5.2
16	Achnanthes minutissima	5	0.6	237	0.1
17	Tabellaria fenestrata	5	0.6	11,370	5.5
18	Melosira italica	5	0.6	8,925	4.3
19	Achnanthes recurvata	5	0.6	379	0.2
20	Navicula radiosa	5	0.6	1,540	0.7
21	Asterionella formosa	5	0.6	8,338	4.1
22	Navicula viridula	5	0.6	2,132	1.0

APPENDIX

Phytoplankton Data