LIMNOLOGY PRACTICUM POSTER SESSION 2013

STUDENT INDEPENDENT PROJECTS

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ABSTRACT BOOK

SONG LAKE and other KETTLE LAKE PROJECTS

A Mussel by any other name…

Implications of a potential zebra mussel invasion in Song Lake

Avriel Diaz and Emily Landers

Song Lake is located in Tully, New York. It is unusual in that it has no stream inlets or outlets and it does not allow access for public non-lake-resident boating or swimming activities. These two things have contributed to the fact that it has very few non-native or invasive species.

Currently, the lake is only known to be inhabited by the family of native "pearly mussels" called Unionidae, which is experiencing population declines and extinctions at high rates throughout North America. Specimens of the unionid species residing in Song Lake, likely *Lampsilis radiata*, were used for this experiment. Little York Lake, which is only a few miles away from Song Lake has been colonized by an invasive species of mussels from Asia, *Dreissena polymorpha*, commonly known as zebra mussels. The introduction of zebra mussels in a lake can lead to dramatic alterations in its ecological balance.

Our objectives were to determine how the introduction of *D. polymorpha* would affect Song Lake compared to *Lampsilis radiata,* the native Eastern Lampmussel. To do this we measured how the two sets of mussels affect phytoplankton consumption, nutrient release, bioturbation, and average rate of change in dissolved oxygen found in the sediments. Phytoplankton consumption was measured and analyzed for chlorophyll-a using a fluorometer. We measured nutrient release in terms of total dissolved phosphorus using a spectrometer. Differences in bioturbation were measured by spreading equal volumes of brightly-colored microbeads across the sediment surface on day 1. Sediment cores were then taken for each tank on day 13 to measure the relative depths at which the mussels' disturbance displaced the microbeads. Oxygen consumed through the respiration processes was measured using oxygen probes and constructed benthic chambers. The average rates of change in amount of dissolved oxygen were then calculated for each treatment and compared.

After analyzing all data we found that *D. polymorpha experienced* the largest decline of chlorophyll-a, with a statistically significant difference between zebra and unionid tanks from initial readings to day 1. This implies that overall phytoplankton consumption rates were highest in zebra mussel tanks. We also found higher rates of increase in biologically available phosphorus in *D. polymorpha* tanks, with *a* statistically significant difference between the unionid and zebra tanks after 13 days. Bioturbation in the sediments was qualitatively observed to be highest in unionid tanks. Finally, the *L. radiata* tanks showed a statistically significant higher rate of oxygen consumption at the sediment-water interface compared to the control, which implies that the unionids promote microbial activity in the sediments.

What's in the muck? A benthic analysis of Song Lake

Anastassia Zabirova, Katherine McManus and Jesse Olsen

The benthos of a lake is an extremely diverse community and can be a good indication of the nutrients, organic material and organisms that occur within it. Song Lake is a small kettle lake located in Tully, New York with private residential homes located all along the perimeter of the lake. In order to assess Song Lake's benthic community, a petite PONAR was used at varying depths and along all shorelines of the lake. There were 23 sites in total. Samples 1-8 were examined for invertebrate counts and all 23 samples were measured out into drying tins, crushed to homogenize the sediments, sieved and put into an oven at 105°C for 24 hours and then burned at 470°C for 15 hours. The difference in dried versus burned masses was calculated for organic content. The data showed that there was a decreased amount of organic matter at deeper depths as well as a significant difference between the percent organic matter on the southwestern side of the lake (developed) and the southeastern side (forested). The findings lead to the idea that although septic and sewage systems are present on the southwestern side, there is likely more allochthonous input on the southeastern side that accounts for the greater percentage of organic matter. Chemical analysis of nutrients such as C:N ratios, as well as phosphate concentrations, may be done to determine the nutrient loading within the lake.

Heavy Fish, Light Fish, Yellow Perch, White Fish

Ian Kenney, Harold Nugent

Song and Tully Lakes of Cortland County are neighboring kettle lakes. Tully Lake is a public lake used by local fisherman, while Song Lake is a private lake used only by the residents. As such popular places for recreation, proper management of these lakes requires information on the different species of fish that inhabit the lakes, the size of those species' populations, and the relative health of those populations. The objective of this study was to assess the relative 'health' or condition of fish populations in these lakes by comparing each lake's fish populations to New York State DEC standards using fish length to weight ratios. Yellow Perch (*Perca flavescens*) populations from both Song and Tully lakes and the Chain Pickerel (*Esox niger*) population of Tully Lake were selected for analysis based on their popularity as sport fish and our ability to gain a sufficient sample of each species. Gill nets and seines were used to collect samples. After analysis, it was found that the condition of the Perch population of Song Lake was lower than DEC standards, but the result was not statistically significant. However, the condition of the Yellow Perch and Chain Pickerel populations of Tully Lake were found to exceed DEC standards, but only the Yellow Perch was found to be statistically significant. This study can act as preliminary research to assess exactly why the fish populations of Tully Lake exceed DEC standards, while populations of neighboring Song Lake fail to meet them. Possible factors explaining the differing 'health' of the populations for future study could include lake morphometry, shoreline development, harmful algal blooms, and excessive fishing pressure.

While sampling, there were some unexpected finds as well. Numerous Perch from both lakes and many Banded Killifish and Tessellated Darters from Tully Lake were found to have a parasite which is seen as

black spots on the fish. The parasite is believed to be *Crassiphiala bulboglossa*, which is not uncommon in the region, and is not harmful to people. What was more exciting, a Whitefish (likely *Coregonus artedi*) was caught on Tully Lake! This individual may represent a population of Whitefish from the region that is perhaps related to extirpated whitefish from Onondaga Lake, and whitefish in some other local oligotrophic lakes with oxygenated cold water refuges; the whitefish was preserved for genetic analysis.

PROJECTS ON OTHER AQUATIC SYSTEMS

Dam Drifting Dipterans (and other various macroinvertebrates):

The Effects of Controlled Flow Rate on Macroinvertebrate Drift in the Salmon River

Christopher Marshall, Katelyn Zonneville, and Donald Arthur

The Salmon River of Oswego County is renowned for its drastic changes of currents and water levels due to the hydroelectric dam at the middle portion of the river. Since the introduction of the economically important Chinook salmon and other *Onchorhynchus* spp., the Brookfield Renewable Power has been mandated to manage flows as to not cause such extreme swings in flows as it had in the past.. The power company releases water to compensate for forecasted rainfall that would fill the dam, provide optimal stream flow for migrating fish, and still meet hydropower demands. The purpose of this research was to investigate the effect of these man-controlled changes of stream flow on the macroinvertebrate drift. Drift is a common behavior of macroinvertebrates in the stream habitat to acquire food and avoid predation. Drift can also be catastrophic and unintentional.

We predicted that an increased flow from the hydroelectric dam would increase macroinvertebrate drift, and that drift would also vary between orders. By placing a drift net at a sample site located 1.35km below the dam, we sampled for 45 minutes at the macroinvertebrates drifting at a particular daily flow rate and stream velocity. An apple drifted over a known distance measured by a meter tape and timed with a stop-watch was used to calculate stream velocity that was synonymous for flow rate. This sampling procedure was performed over nine different days all at different flows. The insects were identified to family, where necessary.

Using a linear regression, it was found that as stream velocity or flow rate increased, macroinvertebrate drift amongst all captured orders increased with an R^2-value of .5179. Ephemeroptera drift was greatest at low velocities compared to both moderate and high velocities and was found to be significant using an ANOVA statistical test ($p=0.013$). The Trichopteran drift between low velocities and high velocities was found to be significantly different ($p=0.002$). The p-value for the Dipterans was calculated as 0.003, which indicates a significant difference in drift between low and high velocities. These values may imply that low flow rates are indicative of active drift, dominated by strong-swimming Ephemeroptera, and comparatively that high flow rates correspond with catastrophic drift and include more poor swimming taxa, such as Diptera and Trichoptera, which is what we hypothesized. The swimming ability of

macroinvertebrates directly relates to the type of drift that they are associated with. We found it interesting that there was a significant decrease in drift at moderate flows (0.75-1.25m/s), but due to our lack of sampling within this range of flow, it is subject for future study to see if macroinvertebrates can sense increasing flow and cease active drift.

What's in the Foam?

Erik Hazelton

The foam of lakes is relatively understudied as compared to the foam that accumulates in streams. Aquatic hyphomycetes are indicator species and play important roles in the aquatic food web. The purpose of this study was to find out what aquatic hyphomycetes and other organisms make up the composition of lake foam. Foam samples were gathered from Skaneateles Lake and Butternut Creek and observed with a compound microscope. A Sørenson's coefficient of community similarity value of 0.004 was calculated, indicating very low overlap of species in the lake and creek foam. We rejected the null hypothesis that lake and stream foam contain the same diversity of organisms (t-test; $p<0.05$.) We saw that there was an overall greater diversity in the foam of Butternut Creek than in Skaneateles Lake. Hyphomycetes are important to study because they have a fundamental role in matter circulation, energy flow, and biological balance.

Is Your Stream Healthy? IBI Analysis within Streams in Central NY State

Edward Kwietniewski and Christian Jenne

The Index of Biological Integrity (IBI) is a very useful tool that can be utilized by aquatic ecologists and biologists to assess the health of an aquatic system. The IBI is a numerical scale that will vary based on the assemblages of organisms and how well they can tolerate various water qualities. This information can then be used to create a better management plan for the watershed and help set goals for desired water qualities. Three streams of hypothesized different water qualities in Central NY (Barry Park, Webster Pond, Carpenter's Brook) were electroshocked for fish assemblage data in order to perform an IBI test on these assemblages. Our objective was to test the effectiveness of the IBI tool and see if there were indeed any differences amongst our sampled sites in terms of water quality. Our results generally supported the IBI as an effective tool to assess water quality and gave a quantifiable value to each of our stream's health. Our suggested poor water quality site, Barry Park, did show the lowest IBI score (quantified as poor). However, it was Webster Pond, not Carpenter's Brook that showed the highest score (34 to 30, both fair). This could be best explained by the presence of some warm water species of fish that were not present at Carpenter's Brook as well as the fact that Webster Pond's stream is in a protected forest reserve that stems from a spring. Future research should investigate other organisms for IBI testing, such as macroinvertebrates, to see if scores correlate amongst different types of organisms.

Rock n' Flow: Fluctuations of Elemental Concentrations as a Result of Geological Formations along Ninemile Creek

Grace A. Dossert, Noah T. Pasqua-Godkin, and Rinnan M. Whitford

Geological formations can affect the composition of elements found in water systems. Ninemile Creek runs 22 miles from Otisco Lake to Onondaga Lake. The geological layout along Ninemile Creek was surveyed and mapped as early as 1842. Several unique formations have been recorded including a Calcareous Tufa bedrock formation and gypsum deposits. We hypothesized that these geological formations influence chemical composition of water in Ninemile Creek. Samples were taken at 14 different locations along the creek and concentrations of several elements (sulfur, potassium, calcium, magnesium and silicon) were analyzed by SUNY ESF's ATS lab and compared with the geological formations. Three separate areas along the creek had noticeable spikes in elemental concentrations; these coincided with geological formations as well as the location of the Solvay waste beds near Onondaga Lake. Calcareous Tufa is known for high concentrations of calcium, gypsum for sulfur and calcium, and Solvay waste beds are known to have higher concentrations of silica, calcium, sulfur, and potassium. Spikes in calcium were seen where there were confirmed locations of Calcareous Tufa bedrock formation, and gypsum deposits, and Solvay waste beds. Spikes in potassium and manganese were seen along the location of Solvay waste beds, where surface water runoff most may aid in transportation of these elements into Ninemile Creek. Spikes in sulfur concentrations were seen where there are confirmed locations of gypsum deposits and sulfur springs in the Marcellus/Camillus area along Ninemile Creek. Spikes in silica concentrations were seen near the Solvay waste beds. These results suggest that both geology and anthropogenic alterations to sediments affect the water chemistry of Ninemile Creek. This information can be important, especially now since the Onondaga Lake cleanup is in process. Knowing baseline concentrations of elements entering the lake can help experts understand the "natural inputs" of elements into the lake.

Using GIS to Infer Anthropogenic Effects on Finger Lakes

Wendy Huang, Ian MacColl and Keshav Sauba

The Finger Lakes consists of a series of 11 lakes found in upstate New York. These lakes were formed by glacial processes approximately 10,000 years ago. Due to recent anthropogenic influences on the Finger Lakes watershed, these water bodies may have experienced nutrient loading. Our first hypothesis is the increase in total watershed area around the lakes correlates with the change in water quality by increasing the concentration of total nitrogen (TN), total phosphorus (TP), total dissolved silica, Secchi depth and chlorophyll a. ArcGIS was used to determine the watershed area along with wetland area for each watershed area. Regression analysis was used to determine the coefficient of determination (R2). Our second hypothesis was that increase in crop area within the watershed increases amount of nutrients within the lakes. Lastly, our third hypothesis is the increase in wetland area increased nutrient loading into the lakes. Four lakes which include: Cayuga, Seneca, Owasco and Skaneateles were chosen for the purpose of comparison because of their close proximity to Syracuse. The low R2 values obtained suggest that there may be other factors affecting the nutrient loading or that a multiple factor analysis would be more appropriate.