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Cranberry Lake Biological Station Research Symposium, Session B

SUNY College of Environmental Science and Forestry

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SUNY – ESF Dept. of Environmental and Forest Biology
Cranberry Lake Biological Station
Ecological Monitoring and Biodiversity Assessment
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Amphibians

McGowan, Kyle A., Victoria D. Proulx, Noelle D. Stevens. Preferred Vegetation of Northern Green Frogs (*Lithobates clamitans melanota*) The northern green frog (*Lithobates clamitans melanota*) is generally found along the banks of ponds, where there is a variety of vegetation. However, is there a particular type of vegetation they are most commonly found in? We hypothesized that the majority of northern green frogs would prefer to situate themselves along the bank in short vegetation, rather than in dense, tall vegetation. Additionally, we hypothesized that more male frogs would prefer short vegetation than female frogs. To conduct our study, we used plot sampling. One-hundred meter transects were set up along the two longest, opposite banks of each pond. At five meter intervals, the bank was surveyed for green frogs, noting what vegetation they were in, as well as their sex. To assess the findings of our study, a Chi-square test was performed, which determined that there was a significant difference in what type of vegetation green frogs chose to reside in. A two proportions test was utilized to analyze vegetation preference by gender, which showed no significance between the two. Understanding habitat choices of northern green frogs will help provide insight on their distribution throughout the area.

Roukis, Alex C., Dylan J. Mahalko, Melanie R. Sturtz, and Tim O. Bova., Relative abundance between *Lithobates septentrionalis* and *Lithobates catesbeianus* in Adirondack ponds and wetlands. *L. septentrionalis* (mink frog) is a heat-sensitive species of frog that lives in wetlands formed by beavers. With a rise in global temperatures threatening the southernmost populations, *L. catesbeianus* (American bullfrog), a predator of *L. septentrionalis*, may be having an oversized effect on the Adirondack population. It was hypothesized an increase in *L. catesbeianus* in an area would result in a decrease of *L. septentrionalis*. Five ponds of varying size in the Cranberry Lake Biological Station were used as experimental units, with two timed half-hour transects on the edge of the pond as sampling units. The total number of frogs identified on the transects was recorded. A regression test was used to analyze the data collected. Based on collected data, there was a poor negative regression between populations of *L. septentrionalis* and *L. catesbeianus*, with an R-squared value of 8.6% and a p-value of 0.631. Our findings indicate that there is no negative impact of *L. catesbeianus* on *L. septentrionalis* in the Cranberry Lake region of the Adirondacks. For future studies, it might be appropriate to conduct this same research throughout the Adirondack Park in order to confirm or disprove these small-scale results.

Invertebrates

Johnson, Samuel., Jeffery Guerard, Joshua Bordeaux and Tyler Abatelli. Abundance and Diversity of Micro-invertebrates in Sphagnum Moss in Multiple Environments. Sphagnum moss is a common habitat for many microorganisms due to its high water retention that allows important decomposers to cycle nutrients in an ecosystem. This study was conducted to show abundance and diversity of micro-invertebrates in sphagnum moss throughout multiple environments including forests, peatlands and streams. We first hypothesized that sphagnum moss in peatland areas would contain more micro-invertebrates per 10 mL of water than in forests and streams. Secondly, we hypothesized there would be greater micro-invertebrate diversity in sphagnum moss per 10ml water in peatlands than in forests and streams. Three experimental sites were chosen from each environment, with 27 samples of moss being taken and placed in water. Samples of the water were observed under compound microscopes and micro-invertebrates were counted then placed into Excel and Minitab to find means, standard deviation, and diversity index. Data failed to reject the first null hypothesis due to the statistical overlap in standard deviations. Second null hypothesis for diversity was rejected. We found that statistically that there was no significant difference between the three environments. This leads to questions regarding what factors may influence this trend and possible avenues for future research like preferences of micro-invertebrates for different sphagnum species.

Snodgrass, Jason J., Joseph R. Dizer, John D. Owczarczak, and Daniel J. Douglas. Effects of the Yellow Pond Lily on the Abundance of Benthic Aquatic Macroinvertebrates in Cranberry Lake. The benthic region of the shallow nearshore habitats of Cranberry Lake are home to various aquatic macroinvertebrate classifications. The Yellow Pond Lily (*Nuphar lutea*) also occurs in these nearshore habitats, and can provide suitable areas for macroinvertebrate breeding and egg deposition. We hypothesized that a larger population of benthic macroinvertebrates would be observed in soil samples taken in close proximity to clusters of Yellow Pond Lilies compared to samples taken farther from the Lily clusters. A 20m transect line was anchored from the center of Yellow Pond Lily clusters at ten nearshore sites around the lake, and an ekman sampler was used to retrieve five soil samples at 5m increments along the transect line. Equal volumes of each sample were sifted, and a count of the macroinvertebrates observed in each sample was established. A regression line plot was set up to test the total number of macroinvertebrates at each sampling distance (R Squared value= 7.5%, P value=.655, $y=71.2-.78x$). The data showed no correlation between macroinvertebrate population and proximity to Yellow Pond Lilies, thus rejecting our original hypothesis.

Louk, Rosalyn M., Antoinette Esposito, Arianna L. DeAngelo, Isabella D. Mitchell. A Comparison of Macroinvertebrate Assemblages Found in Forest Fungi of Different Hymenium Types. Insects and fungi are known to play important roles in overall forest health; however, the relationship between the two is not well studied. In the field we observed insects in gilled mushrooms. This led us to question if other fungal fruiting bodies also contained macroinvertebrate assemblages. We hypothesized that there would be a significant difference of macroinvertebrate assemblages between the three hymenial types studied: gilled, pored, and tubed. We also hypothesized that older fungi would contain larger assemblages of macroinvertebrates. Fungi were collected from five different areas at Cranberry Lake Biological Station. Macroinvertebrates were extracted using Berlese funnels for 4.5-5 hours. The fungi represent both experimental and sampling units (n=32), which are independent of the macroinvertebrate assemblages. ANOVA and Tukey tests were used to analyze data and results will be presented and discussed. Both larval and adult forms were found within the fruiting bodies, where the fungi appear to be serving as a food source and reproductive site for numerous macroinvertebrates.

McCabe, Meara A., Nathan A. Tyler and Alexandra A. Cormack. Study of Color Coordination in Camouflaged Moths. Moths are an incredibly diverse group of insects that have various forms of camouflage that allow them to blend into tree trunks, leaves, bird poop, etc. The assumption is that these moths will attempt to blend into their surroundings via color coordination. We hypothesize that moths will more often be found on surfaces that complement or match the color of the moth. Our experimental unit was four colored cloths placed for the moths to choose between and rest on; our sampling unit was eight lights used to attract moths. The cloths were checked three times a night, then all moths were identified and recorded along with what color cloth they were resting on. Any moths that had stayed throughout the night were only counted once. A Chi-squared test will be used to compare all the moths that chose their corresponding color to the cloth versus the moths that chose cloth they did not camouflage with. Two proportion tests will be used to compare each color cloth and whether the moth landing on it had a match color or not. We expect that significantly more moths will land on the cloth that they blend in with, which leads to the idea that moths are able to detect their surroundings and where they can hide.

Erin Fingar, Josh Cantor, Bailey Whiffen, and Shannon Walsh. Assessment of Biodiversity Differs on *Ulota Crispa* and *Parmotrema perforatum*. Microorganisms are found in a wide variety in many habitats including lichens and moss. Terrestrial microorganisms require a certain amount of water in order to be active within their environment. Therefore, this experiment was to see if either moss or lichen is more biologically diverse. We hypothesize that there will be more biodiversity of microorganisms found on moss, since mosses contain a higher concentration of water. Three trees we took moss and lichen from are considered our experimental unit while the microorganism communities found on moss samples at the base of maple trees and communities on lichen found on the trunk are the sampling units. We took six bags and placed 5 grams of moss in three of the bags and 5 grams of lichen in the other three bags with 10 milliliters of water per each bag. We then let the samples soak for an hour before straining the large particles out of the water. The number of microorganisms were then found in the solutions. A t-test will be used to compare the amount of biodiversity on the *Ulota Crispa* and the *Parmotrema perforatum*. Another t-test will be used to compare the different microorganisms that were found within the lichen and moss. Biodiversity plays a large role in boosting ecosystem productivity in every species, even the small ones.

Molly C. Suba, Margaret R. Pasanen, Andrea C. Smith, Jack Zeng. Aviation Predation Based on Different Color Morphs and Habitats. This experiment aimed to understand if there is a significant difference in color caterpillar being predated upon by birds in the CLBS region, and if habitats close or far from water bodies have a significant difference in predation. We hypothesize red clay caterpillars will have a higher percent predation than yellow or green clay caterpillars (n=1,080), and a higher percent predation along transects located near water bodies (n=6). Red, green, and yellow caterpillars were placed along 12, 10m transects in the CLBS region, 6 transects 1 m from water body, 6 transects 101 m from water body. Thirty caterpillars, 10 of each color, were placed along transects on Whoosh Pond, Upper Whoosh, and Forsaith's Bog and checked for number bitten every 24 hours, for 3 days. To analyze color caterpillar data we used ANOVA, while Tukey was not applicable, and a T-test was used to compare data from different distance waterbodies. Through these tests, it can be concluded that neither the caterpillar color data nor the water body distance data is significant. This data is critical for understanding bird predation habitats on specific communities of caterpillars as well as the effects of edge habitats on bird populations.

Howe, Cortnee A., Allison A. Becker, Zakery T. Ward, and Zachary S. Warning. Zooplankton Prosperity in Differing Water Clarities. Hemlock Woolly Adelgid (*Adelges tsugae*) threatens to remove the Eastern hemlock from Cranberry Lake, increasing lake clarity by exterminating a heavy tannin producer. We hypothesized there would be a significant difference in prosperity of zooplankton between water clarities, the clearest water having the highest prosperity. A secchi depth was recorded at CLBS shoreline, pH, temperature and DO were recorded using lab-quest probes, and the zooplankton sample was taken using a zooplankton net near shore, splitting the sample into four treatments of varying water clarities. Each was replicated four times. Zooplankton were counted with compound microscopes and counting slides and compared from living to dead individuals every 12 hours. Our results showed there was no significant difference in the lake water, as well as our 1/3 DI water / 2/3 lake water. The results also showed there was a significant difference in zooplankton prosperity in our 2/3 DI water / 1/3 lake water. These results are important as the Woolly Adelgid will soon be here at CLBS knocking out the Eastern hemlock, creating clearer waters in the lake over time which will have a chain reaction on the food chain in the lake.

Plants

Krauss, Amber, Emelia Yost, Joseph Sullivan, Jesse Yale. Investigative Observational Study of the Relationship Between Canopy Closure and Bryophyte Species Diversity on Boulders. Bryophytes are an essential component of forest diversity, and their growth is influenced by numerous factors. In our study, we searched for a correlation between light penetrance through the canopy and species diversity of bryophytes growing on boulders. We hypothesized that species diversity would correlate negatively with increased light penetrance. Our hypothesis was tested by sampling 68 boulders, which served as both our experimental and sample units, along trails throughout the station in a random-systematic design. At each boulder, we measured light penetrance in the form of canopy closure via a spherical densiometer, as well as species richness and percent coverage, which were measured by a species count, and the laying of transects a meter apart along the longest axis of the boulder. Our data was evaluated using the Shannon-wiener diversity index. The Regression model will be used to relate species diversity to light penetrance. Bryophyte species represent a significant portion of forest diversity and their presence can be indicative of forest health. Understanding the limiting factors that affect their growth can help us to more accurately evaluate the overall health of a forest community.

Alfaro, Maria, Margaret Tryon, Kenneth Windstein and Danielle Wontor. Effects of Tamarack (*Larix laricina*), Speckled Alder (*Alnus incana*), and Black Spruce (*Picea mariana*) on Herbaceous and Shrubby Plant Communities in Peatlands. Peatlands are nutrient deprived wetland ecosystems with herbaceous and shrubby plant communities (HSPC) specialized to survive these conditions. Understanding correlations between nutrient content and species richness is integral to conserving vulnerable, unique species. We hypothesized that when compared to black spruce and tamarack, speckled alder would have the greatest HSPC diversity and variance in abundance of species with different nutrient tolerance levels due to its ability to introduce nitrogen. Five individuals (sample units) of each tree species population (experimental units) in Big Pine Bog, Forsaith Bog, and Bear Mountain Bog, were haphazardly sampled using two quadrats one meter squared (subsample units) Northeast and Southwest from each tree. HSPC species diversity and abundance were recorded for individual trees (>1 meter dripline), half the quadrat placed within the dripline and half outside. Species were categorized as tolerant, intolerant, and specialized to low-nutrient conditions in order to perform three ANOVA tests. ANOVA was also used to analyze HSPC species diversity among tree species. There was no significant difference in HSPC diversity ($F=2.56$, $p=0.157$) or abundance of intolerant ($F=0.36$, $p=0.713$), specialized ($F=1.32$, $p=0.335$), and tolerant ($F=0.10$, $p=0.910$) HSPC species among the three tree species. Future studies should focus on clearly quantifying nutrient content in connection with HSPC diversity not only with respect to different tree species but also across peatlands.

Taylor J. Boria, Conor J. Clancy, Gray N. Lauterbach, Sasha Ruschmeyer. An Analysis of the Anti-Microbial Properties of *Pluerozium schreberi*, *Hypnum imponens*, and *Hedwigia ciliata* Mosses are often regarded for their antimicrobial properties, in part due to their use by birds in their nests as bird feces are known to vector various diseases. To test their anti-microbial properties, bacterial colonies were cultivated from various bird feces samples. Four populations of the aforementioned three species of moss were collected. Half of each moss sample was washed and all samples were chopped. Mosses were introduced to bacteria cultures to test diameter (mm) of the area of inhibition of bacteria growth. A t-test ($t=0.02$, $p=0.98$) was utilized to determine that there was no significant difference between washed and unwashed mosses. ANOVA and Tukey's test ($F=14.26$, $p=0.00$) were utilized to determine that the three moss species were statistically significant in their anti-microbial affects. This study shows that moss is an effective agent against microbes in bird feces.

Nina Hilmarsdottir-Puetzer, Claire Whalen, Hyunjung Lee, and Sarah Welz. The Impact of Iron Contamination on Diversity: Comparing Species Assemblages on Coarse Woody Debris, Rock, and Iron. Several landfills and piles of iron around Cranberry Lake have probably been left untouched for over 50 years. These dumps impact diversity by occupying niche space with undesirable substrates, such as iron. To determine the potential of iron as a substrate, we compared floral communities growing on iron to communities that grew on nearby rocks and logs. We hypothesized that the iron substrates would be most similar to themselves while the natural substrates (wood, rock) would be more similar to each other in species richness than to the iron in composition. Seven experimental units of each substrate were sampled using string transects. Each substrate width was divided into sixths and transects were laid out for every other measurement (3 total). Bryophyte, lichen, plant, and fungi were surveyed and assessed for each substrate. We will run an ANOVA test to determine the similarities between substrates as well as a weighted Simpson's index to assess overall diversity for each substrate. Results will be presented and discussed. We anticipate that the iron substrate will be less diverse overall and least similar to the rock and log communities. This is significant information in the conversation around waste and how it impacts ecological assemblages.

Birds

Thompson, Jordan M., Addison Kubik, Michael Rickershauser, Gabriel Deutchman-Ruiz. Case Study on the Diversity of Avifauna at Cranberry Lake Biological Station. Forest structure and composition is vital to the life history of forest-inhabiting bird species, because it provides both food and nesting sites. We hypothesize that diversity of avifauna will increase with vertical structural diversity of the canopy, tree species richness, and mean basal area. We conducted 25 point counts and respective habitat surveys (n=25) along 7 parallel transects running west to east within our experimental unit that is CLBS. Point counts were conducted for 15 minutes, accounting for every bird seen and heard within a 50m radius. Habitat measurements were done by creating 100x100m plots surrounding the bird point counts, dividing it into 25x25m quartiles and conducting 1 Bitterlich prism survey to measure mean basal area and 4 vertical structure diversity surveys in each quartile. Regression tests will be used to relate the diversity of avifauna to vertical structural diversity and plant species richness separately. Results will be presented and discussed during the presentation. These results will be important to understanding what forest types are most utilized by avifauna in the Cranberry Lake Biological Station region.

Stein, Rachel, Erin Baccari, and Lydia Martin. Behavioral response of Red-Eyed Vireo (*Vireo olivaceus*) to song playback of conspecifics and heterospecifics. Interspecific relationships of migratory species can be complex, and song is an important tool used by many birds to convey territory and locate mates. The abundant Red-eyed Vireo (REVI) can be used as a model species to investigate varying responses to song of conspecifics and heterospecifics. We hypothesized REVI would have the strongest reaction to song of Philadelphia Vireo, PHVI (*Vireo philadelphicus*), moderate reaction to song of REVI, and minimal reaction to song of Blue-headed Vireo, BHVI (*Vireo solitarius*). Focal-animal sampling was used to observe agonistic behaviors of 60 Red-eyed Vireo in response to playback of songs of these species ($n_{\text{blue}} = 20$, $n_{\text{philadelphia}} = 20$, $n_{\text{red}} = 20$). An ANOVA ($F(2) = 404.39$, $p = 0.000$) with subsequent Tukey was run, indicating time until subject approached was significantly different among all 3 songs (BHVI: $\bar{x} = 180.0$, REVI: $\bar{x} = 45.50$, PHVI: $\bar{x} = 24.45$). Chi Squared tests were also run (canopy level of bird: $\chi^2 = 15.132$, $df = 4$, $p = 0.004$; response behaviors: $\chi^2 = 36.398$, $df = 4$, $p = 0.000$). Results indicate REVI exhibits varying levels of agonistic responses depending on species of singer. Future studies could also measure fecundity and survivability of REVI to determine if there's a relationship between these behaviors and overall fitness.

Fungi

Beck, Cameron E., Matthew A. Orgek and Melissa A. Phillips. Abundance and Species Richness of Aquatic Hyphomycetes in Upstream and Downstream Adirondack Habitats. Aquatic hyphomycetes have a significant role in stream ecosystems so it's important to study what factors affect their abundance and species richness. We hypothesized that downstream locations would have increased abundance (individuals per .1 mL) and species richness (species per .1mL) compared to upstream locations because of increased dissolved oxygen levels downstream. Three samples of crusty foam were taken near headwaters and mouth of three separate streams in the Cranberry Lake region. Dissolved oxygen (DO) was also measured (mg/L) at each collection site. Experimental units were three separate streams and six sample units of foam were taken from each stream. Foam samples were observed in 0.1 mL amounts under compound microscopes to identify and record amounts of conidia from different species. Abundance and richness values were run through a two-sample t-test. Results show that there is greater species abundance in downstream habitats compared to upstream, while there is no statistical difference in species richness. DO was tested against abundance and species richness using a regression model. Results show that DO level is not a good predictor variable for neither abundance nor species richness. Since DO has been eliminated as a good predictor of abundance and richness, other studies can be done to find what factors have a more direct effect.

Hilles, Gwen E., Evan J. Stewart and Hanna M. Whalen. Preferred Ecological Conditions: Substrate Moisture, Light Intensity, and Vertical Position of Various Species of Slime Mold Fruiting Bodies at Cranberry Lake Biological Station. Slime molds are protists with two distinct life phases: unicellular and plasmodial. Their aggregation behavior in the plasmodial phase leads to the release of spores which propagate the next generation in times of stress. Due to common pressures that trigger formation of fruiting bodies, the resulting location of these structures would theoretically be uniform across all species. We hypothesized that fruiting structure locations would be characterized by low levels of light, high substrate moisture, and elevated vertical position with no significant variance between individual species. We performed timed meanders on two transects spaced along four different trails, marking every encountered slime mold. Photon flux density (lux) at each site was compared to open area, and the height (cm) of the slime mold colony compared total substrate height (cm). Moisture content of substrate was measured by weighing wood samples (oz) both before and after drying. We then performed an ANOVA test for each variable to compare differences between species. Our results show slime mold fruiting body location preference to be relatively uniform and not dependent on taxa. This suggests that fruiting tendencies are more dependent on ecological conditions than genetically predisposed behavior characteristic to individual species.