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Cranberry Lake Biological Station Research Symposium, Session C

SUNY College of Environmental Science and Forestry

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Cranberry Lake Biological Station Research Symposium

Session A

2015



Photo by: K. Rose



State University of New York
College of Environmental Science and Forestry

About EFB 202: Ecological Monitoring and Biodiversity Assessment

Ecological Monitoring and Biodiversity Assessment (EFB202) is the one of the keystone courses in the Environmental and Forest Biology curriculum. Students enrolled in this immersive course live at the Cranberry Lake Biological Station for three weeks. During the first two weeks of the course, students study a wide variety of taxonomic groups of organisms, and are introduced to a broad range of field, laboratory and analytical methods. Students then complete a group research project during the third and final week of the course. The research projects require proficiency in field sampling methods, basic experimental design and statistical analysis, and the ability to cooperatively solve problems. The course culminates in a research symposium during which groups present their findings to their peers and a panel of judges. The top three research projects are recognized with the Shields Research Award, named after Dr. Bill Shields, a retired EFB faculty member who conducted many years of research at Cranberry Lake Biological Station.

Dr. Justin Fiene, Director, Cranberry Lake Biological Station

The Effects of pH on the Lethality of Motor Oil (mL) on *Polyphemus pediculus*

Britton Conway, Joseph Nasta and Rachel Rigolosi

Our goal was to test the impact of freshwater acidification and motor oil on a basal aquatic predator, *Polyphemus pediculus*. *P. pediculus* was collected at the CLBS marina and subject to three different pH conditions. Within each condition, *P. pediculus* was also subject to three volumes of motor oil. A population count was taken at certain time intervals over four hours, and an ANOVA test was used for data analysis. Our results indicated altering pH significantly increased lethality of motor oil. However, further decreases in pH did not show any change in the magnitude of lethality. We concluded that altering pH correlates to *P. pediculus*'s resistance to motor oil. Fertilizer or other pollutants of freshwater ecosystems can also be used to see if altering pH has the same effect.

The Effect of Increasing Concentrations of Gasoline in the Waters of Cranberry Lake on two populations of *Gerris remigis*

Stephen Scaduto, Shourjya Majumder, and Wade Leung

Water striders are aquatic insects that can glide across the water because of tiny hydrophobic hairs on their legs that utilize the surface tension of the water. The question posed was whether increasing concentrations of gasoline will increase mortality rate between two populations of water striders and whether there would be a difference in mortality rate between the two populations. One population came from Sucker Brook (area with little boat traffic), and the other population from the marina (area with heavy boat traffic). 90 striders were taken from each population and split evenly between nine tanks, which were split into three groups: a control group, a "low concentration" group (1 drop), and a "high" concentration group (2 drops). The concentration of oil was increased every day, for four days, and total number of surviving striders were counted each day. ANOVA test showed both of populations were equally susceptible to gasoline. It was found that increasing gasoline concentrations increases mortality and there was not a significant difference between the two populations in terms of longevity. These results show increasing concentrations of gasoline increases mortality in water striders.

The variation of aquatic foam production in Sucker Brook, Cranberry Lake, New York, using American beech, yellow birch, and black cherry.

Victoria Moreno, Maria Stutzman, and Taylor Hendrickson

Aquatic foam is formed on the surface of water through a natural process caused by the production of surfactants, which are given off by plant material in the water. After an initial experiment, it was discovered that logs produce more foam than leaves. Subsequently, an experiment was started to test if certain species of trees would produce more foam than others after observing differing amounts of foam being produced by different tree species in the initial experiment. It was predicted that yellow birch would produce more foam (m³) than black cherry and American beech. Three fish tanks were set up, each with their own species of logs. Four bubblers and rocks were placed in each tank to help with the agitation of the water and the production of the foam. After being left for six hours, the amount of foam in the tank was measured using volume and an ANOVA test was done to determine if there was a difference in the amount of foam produced. It was found there was no statistical difference in amount of foam produced by differing tree species. Different tree species do not contribute to production of aquatic foam more than others, but logs do produce more foam than leaves.

The Scent of Spring: The ability for *Plethodon cinereus* to recognize *Gyrinophilus porphyriticus* scent in relation to their population overlap

Stradder Caves, Dave Dunn, Emma Kaufman, Alex Romer, and Andrew Bachteler

There is an intricate prey-predator relationship between *Plethodon cinereus* (redback salamander) and *Gyrinophilus porphyriticus* (spring salamander) which can be seen through the reaction of redbacks to the scent of a nearby spring salamander. The ability of the redback salamander to detect the scent of a spring salamander was tested as well as the reactions of neighboring population of redbacks that have had no exposure to spring salamanders. To determine the reactions of these neighboring redback populations, a spring salamander was placed on one side of a divided terrarium for 3 hours so the predators scent was left behind. Once the divider was removed, one half of the terrarium was scentless and the other half filled with the scent. Redbacks were then individually placed in the center of the terrarium for 5 minutes. At the end of the timed interval, position of the redback from the starting position was recorded. To account for any preference, a control was performed by placing a redback in a terrarium with no spring

salamander scent and recording which side the redback went to. Under the controlled conditions, salamanders would move around at random. The experimental trials involved testing salamanders from populations with various levels of interaction with spring salamanders. One population was found in direct proximity with the predator, while the other population was found where there were no spring salamander sightings. Data analysis indicates populations of redback salamanders exposed to the predator actively avoided the scent of the spring salamanders, while the unexposed population did not indicate preference.

Comparing Invertebrate Diversity and Richness in *Sphagnum* Moss Hummock and Hollow Complexes

Connor Maheady, Tori Tremble, Tiffany Reese, and Emily Pomeroy

The Hummock-Hollow complex is a phenomenon commonly found in *Sphagnum* dominated peatland bogs, which provide microhabitats for a variety of invertebrate species. Several abiotic factors such as soil moisture content, soil pH, and moss height vary between these microhabitats, causing an array of species diversity and richness between hummocks and hollows. Random systematic sampling was used and 4 soil samples from each of 3 sample sites were collected. These soil samples were analyzed using the Berlese-Funnel technique, which utilizes heat and light to move invertebrates down the funnel into a collection jar. The data supports the rejection of the null hypothesis: there is greater species richness seen in *Sphagnum* hummocks than in hollows. However, the data suggests that the null hypothesis is accepted for species diversity. Understanding the differences between the two microhabitats is interesting in terms of overall biological value held by these peatland bogs. To continue this study, more replicates could be gathered to see the correlation of species richness and diversity between upland and lowland bogs. *Sphagnum* hummocks are more hospitable for certain invertebrates because they offer a greater variety of niches.

Deciduous vs. Coniferous Trees as Lichen Substrates in the Adirondack Region

Allison McKenna, Allison DeSario, Ben Zink, and Dan Geoffroy

To discover if lichen species in the Adirondack region prefer deciduous trees to coniferous based on the bark pH differences, samples of bark from eleven common species of both types of tree were taken. A study was conducted surveying trees along a point-quarter transect. A total of 64 trees were analyzed at two heights (.75 m and 1.5 m) and two orients (lake-facing and inland-facing). Bark samples were collected for pH testing using a LabQuest probe. The lichen coverage was analyzed using a 10x10 cm transparent grid placed on each orient. We hypothesized lichen will prefer to colonize deciduous trees over coniferous, due to a lower pH. When the data was analyzed, it was found that coniferous trees have 1.0% of surface area colonized by lichen. Deciduous trees have an average of 15.6% surface area colonized, which supports the hypothesis. Obtained 'p' values show a significance when comparing pH to average % coverage for coniferous trees. The value is not significant for deciduous trees; however, there was a higher diversity within deciduous trees. For example, American Beech trees had little to no lichen coverage, but a relatively alkaline pH. Further studies with a focus on deciduous trees may yield reasoning for this diversity.

Epiphytic Moss as an Indicator of Arboreal Vitality

Casey Saslawsky, Andrea Gibbens, and Lindsay Windsor

Assessing arboreal health can be challenging, as factors that contribute to the decline of tree health can be readily apparent or nearly invisible. The objective was to determine the relationship between arboreal health and epiphytic moss coverage (%) in hopes that moss coverage could be an indicator of tree health. Samples of *Acer saccharum* and *Fagus grandifolia* were randomly selected at Cranberry Lake Biological Station. For each tree, moss coverage (%) was estimated and tree health was evaluated on a scale from 1 to 10. For each tree species, a linear regression was performed and suggested a moderate correlation between the two variables (*A. saccharum*: $r^2 = .357$, *F. grandifolia*: $r^2 = .473$). This supports our hypothesis that trees that exhibit signs of poor health will have a higher percentage of moss cover than trees that exhibit signs of good health. Research suggests that trees with poor health may have higher bark moisture levels. Therefore, trees with ill health may provide a more suitable environment for moss growth due to the mesic nature of their bark. Future studies may choose to test this hypothesis in a laboratory setting to identify causality.

Effects of Sex and Age on Crypsis of the American Toad

Morgan Purdy, Allison Brady, Jamie Carroll, Kristopher Weber, and James Longo

Crypsis is the ability of an organism to avoid being seen by other organisms. *Anaxyrus americanus* achieves this through its ability to change its skin color and texture to match its background. Our hypothesis was adult males are less

camouflaged than adult females or juveniles who do not have the sexual selection pressure of being noticed. 100 toads were collected, examined, and photographed (14 females, 11 males, 75 juveniles) in several locations to determine sex, age, and contrast with their substrate. Coloration of toads and their background were given numerical values based on the Munsell soil color key. Based on ANOVA and two-proportion tests, females (74%) were more successful at blending in than males (46%) and juveniles (59%), which had the highest deviation in color compared to their substrate. This is likely due to predation on less camouflaged juveniles, so only those whose color matches the substrate will make it to adulthood. Future studies should test day/night differences in coloration as well as a more in-depth comparison of female and male crypsis.

The Tail of Two Bogs: Effect of Soil Moisture on Dissolved Oxygen and Plant Species Diversity in Forsaith's Bog
Madison Searles, Sarah Roa, and Sonja Wixom

Forsaith's Bog at Cranberry Lake can be divided into two parts; the upper wooded bog and lower open bog. A study was preformed to assess species diversity and abiotic factors (dissolved oxygen, and soil moisture) within and between the two sites. The goal was to identify relationships between the community evenness (Shannon Wiener Index), dominance (Simpson's Diversity Index), richness, and abiotic parameters. We hypothesized there would be a negative correlation between soil moisture and species diversity. Two experimental units were formed with 32 sample units in each, defined by .25 m² quadrat, where species richness and abundance was recorded, as well as soil moisture and dissolved oxygen using the Vernier LabQuest system. The communities were structured similarly in terms of evenness and dominance, but sites were composed of different species. We did not identify a relationship between species diversity parameters and abiotic factors. In future research, the pH and soil nutrients can be examined to further evaluate species evenness, dominance, and richness due to abiotic factors.

Tardigrada Prevalence in Moss Cushion Lifeforms between Habitats at Cranberry Lake
Jessica Brown, Ingrid Forward, and Hannah Smith

THIRD PLACE FOR SHIELDS RESEARCH AWARD

Tardigrades (phylum Tardigrada) are most durable animals due to their ability to enter a state of cryptobiosis during extreme conditions. Tardigrades are often found living in mosses due to the mosses' ability to retain moisture, but can be found in moss in dry habitats due to their ability to survive desiccation. This study assessed the abundance of Tardigrades in moss cushion life forms of marsh, brook, lake shore, and forest habitats. Relative abundance of Tardigrades among sites was quantified, soil pH was measured at each site, and percent moisture at each site was collected. ANOVA and Tukey's Test were used to analyze variance of Tardigrades among the four sites. It was hypothesized that there would be more Tardigrades per gram of moss in the marsh habitat than the brook, lake shore, and forest habitats. There was no significant difference found in abundance of tardigrades among different habitats. In conclusion, the habitat in which the moss was located did not affect the amount of Tardigrades in the moss. A study looking at specific species of moss among or at habitats with greater differences in moisture content is recommended.

***Polyphemus pediculus* survivorship in insect repellent treated water**
Camila Ferguson, Chloe Blaisdell, Sarah Lundy, and Michaela Tersmette

FIRST PLACE FOR SHIELDS RESEARCH AWARD

At Cranberry Lake, one of the most commonly used topical products is insect repellent. Insect repellents are manufactured with varying percentages of DEET, or no DEET at all. DEET is a synthetic chemical consisting of organic compounds originally intended for jungle warfare. Trace amounts of DEET are found in local waterways throughout the summer, when swimming is a popular activity. This study focuses on *Polyphemus pediculus*, a zooplankton at the bottom of the aquatic food chain. *Polyphemus pediculus* is abundant in Cranberry Lake and is an indicator for health and functionality of the lake ecosystem. Three insect repellents containing varying percentages of DEET and two DEET-free repellents were tested on *Polyphemus pediculus* at high (6µL), medium (4µL), and low (2µL) amounts. The survivorship of zooplankton was observed over 30 minutes. It was found that insect repellants containing higher percentages of DEET killed *Polyphemus* faster than those containing lower percentages of DEET. It was also found that one DEET-free insect repellent killed the zooplankton at an equal rate, while the other killed them at a slower rate. Larger amounts of insect

repellent in the water also killed *Polyphemus* faster. All insect repellents used in the experiment had adverse effects on survivorship on zooplankton, which should be taken into consideration before entering waterways. It can be concluded that insect repellent, even in trace amounts, can be detrimental to aquatic systems.

Stumpies vs. Stumps: Life History Strategies of Mosses Found on Stumps in Cranberry Lake

Jason Bonet, Kylie Mosher, and Lindsey Jerome

Most stumps in Cranberry Lake have been colonized by a variety of mosses. As mosses follow specific life history strategies that influence where they are best suited, moss species found closer to shore are predicted to utilize the fugitive life history strategy, whereas moss species found farther from shore are likely to be perennial stayers. A point sampling technique was used to sample stumps to measure distance (meters) of stumps to the closest landmass. The moss present on the stumps, along with corresponding life history strategies, were recorded. A quadratic regression and paired t-test were calculated. Our results indicated perennial stayers were the dominant life history strategy utilized by mosses on stumps. There was no correlation between distance from shore and life history strategy and there was not a shift from fugitives to perennial stayers with increased distance. Our results indicated such a large amount of perennial stayers because they are long-lived, stress-tolerant, and able to occupy stumps for an extended time. In the future, stump size, height above water, variation in stump conditions dependent on distance from shore, spore size related to stump distance from shore, interactions with fungi on stumps, and percent cover could be taken to take this research further.

The capacity for minnows to habituate to a chemical alarm signal without a predator

Ben Kosalek and Zach Davis

SECOND PLACE FOR SHIELDS RESEARCH AWARD

When minnows are attacked, their epithelial cells release a chemical alarm that will alert other minnows to the presence of a predator. Our study was to see if Creek Chub (*Semotilus atromaculatus*) would habituate to the signal if repeatedly exposed in the absence of a predator and thus ignore it. We tested 20 Creek Chub, half getting the treatment of chemical alarm and the other half a control of water. Each fish was individually exposed to their treatment five times. It was found that there was no change in reaction of the experimental group and Creek Chub had a relatively equal reaction for every trial. As a result, we could not reject our null hypothesis that there would be no change in reaction of fish over the five trials. This shows the reaction to chemical stimulus is an innate behavior that boosts the chances of survival for the minnow.

The Correlation Between soil Nitrogen and Insect predation in *Drosera rotundifolia*

Greg Hornbrook, Cara Overbaugh, and Danielle Preston

Round-leaf Sundew *Drosera rotundifolia* is a carnivorous plant found in wetland habitats throughout the Cranberry Lake Biological Station. Three wetland types (Forsaith's Bog with grassy vegetation, Forsaith's Bog with woody vegetation, and Chair Rock Trail Bog with a mixture of grassy and woody) were sampled, measuring the density of *D. rotundifolia* colonies along with nitrogen content in the substrate by using five meter by two meter transects. Four transect were measured that were spaced five meters apart in each wetland habitat, a substrate sample was taken in the center of each transect. The *D. rotundifolia* species were examined to determine the amount and variety of insect orders that were predated upon in each wetland type. Substrate and water samples were taken to test the hypothesis that with less available nitrogen in the substrate and water table in wetland ecosystems, there would be greater predation on insect populations. Our research found that in Forsaith's Bog, with grassy vegetation, *D. rotundifolia* had the highest substrate nitrogen content along with the highest densities and predated on a wide array of insect orders. In the Forsaith's Bog, with woody vegetation approximately one meter in height, *D. rotundifolia* population was not found in as high of numbers as the previous site. Furthermore, nitrogen content was lower and *D. rotundifolia* did not prey upon as many insect orders. The nitrogen levels at Chair Rock Trail Bog were the lowest of all sites sampled and *D. rotundifolia* predated the highest average number of insects per colony, but fewer orders. These *D. rotundifolia* populations were at lower densities than in sites sampled in Forsaith's Bog. The statistical analysis of all sites did not show a significant difference due to nitrogen, but different vegetation types may play a significant role in nutrient uptake.

American Toad (*Anaxyrus americanus*) Flight Response in Relation to Human Influence

Ryan Benincase, Cadence Hunkins, Jessie Smith

While humans have been becoming more influential on habitats, certain species have adapted to human interaction and have changed their behaviors. This study aimed to test impacts of human interaction and change in habitat to American toad flight response. Twenty-five American toads from Cranberry Lake Biological Station (strong human influence) and twenty five American toads from Albert Island (weak human influence) were tested in their original habitat and a controlled habitat of a sand and grass mixture. Testing was completed by using a hand as a prop coming towards the front of the toad and measuring the distance between toad and prop at the time of flight initiation. The test showed there was a difference in flight response from toads on their original habitat but no significant difference between the two sites when on the controlled habitat. Human influence has a behavioral effect on American toads as seen through distance necessary to trigger flight response, however habitat also plays a factor in behavior. To improve the study, more replicates of toads and habitats will need to be done to support or reject the idea.

Do CLBS bird species respond more aggressively in response to non-migratory bird alarm calls?

Tim Gervascio, Shannon Gordinier, Heidi Faulkner, and Zack Davis.

Bird species local to Cranberry Lake Biological Station, like many others in the northeast, use alarm calls to elicit attention from other birds to potential predators. Mobbing is a response to alarm calls, in which many birds join in aggressively deterring predators. Non-migratory birds have a greater frequency of exposure to threats, and thus a greater potential to gain ecological knowledge about potential threats. Playback experiments were carried out by projecting non-migratory black-capped chickadees (*Poecile atricapillus*), and migratory American robin (*Turdus migratorius*,) alarm calls to forest edge communities for four consecutive days at dawn and dusk. A Kruskal-Wallis analysis of the median response abundance found no significant difference between either experimental treatment ($p < 0.001$, $H = 16.46$ (adj.), $n = 21-17$). A One-Way ANOVA analysis and post-hoc Tukey's Test for the mean response times found no significant difference between experimental treatments ($p < 0.001$, $F = 19.87$, $n = 34 - 17$). The migratory nature of these bird species have no implication on community response to local threats. This indicates it is more beneficial to respond to any alarm call, regardless of the caller's lifestyle.

The Response of Adirondack Birds to the Vocals of *Strix varia* vs. the Vocals of *Megascops kennicottii*

Justin Herne, Nicole Latvis, Matthew Dates, Hannah Matthaei, and Bryn Davies

The native Barred Owl, *Strix varia*, is a predator of Cranberry Lake whereas the non-native Western Screech Owl, *Megascops kennicottii*, is a predator of the Pacific Coast of North America. It is hypothesized there will be more birds calling, singing, and visiting an area when native Barred Owl vocalizations are played as opposed to *M. kennicottii* and control (Common Loon) vocalizations. This was tested in the morning and night along Tower Trail and South Lake Trail, each with six sample sites using alternating calls of native, non-native, or control vocalizations after a 5 minute observatory period. The data was analyzed using ANOVA and Tukey's Test to measure significance of each response. There is a larger mean difference for native vocalization in bird responses when compared to the control and non-native vocalizations. Non-native vocalization had a statistically larger mean difference only in visits when compared to the control. The data collected in this experiment demonstrate prey birds show a stronger response to the native *S. varia* as opposed to the non-native *M. kennicottii*. The results speculate that Adirondack birds recognize vocals of *S. varia* as a predator likely due to experience and learned behavior. There is a lower response to *M. kennicottii* due to the absence of this predatory bird in the Adirondack Park.

Influence of Hiking Trails on Mammal Diversity at SUNY-ESF's Cranberry Lake Biological Station

Samantha Loefflad, Mia Maor, and Paisley Miller

Hiking trails has allowed our presence to increase in natural areas once secluded and undisturbed by human activity. This gives rise to concerns regarding local wildlife diversity and habitat use. Our goal was to determine if there is a difference between mammal diversity near and far from man-made hiking trails at Cranberry Lake Biological Station. We hypothesize mammal diversity at sites far from hiking trails will be higher than near hiking trails. We used mammal signs (i.e. tracks, scat, sightings) in three 50 square meter plots at sights near and far from hiking trails to extract Shannon-Wiener index for diversity. We replicated each near and far site 3 times for a total of 6 different sites. Using a T-test, we detected no significant difference in diversity ($p = 0.067$) between sites near trails (0.49 ± 0.08) and sites away from trails (1.03 ± 0.24). Our results suggest that hiking trails around Cranberry Lake Biological Station do not affect mammal diversity. However, we were only able to test a small area, which resulted in a small sample size and high variation, and therefore may not be reflective of actual circumstances. We suggest additional replications for larger

plots. Furthermore, we suggest additional testing to determine if there is a correlation between human abundance on trails and mammal diversity.

A case study on hay-scented fern (*Dennstaedtia punctilobula*) microhabitat: The effect of hayscented fern diversity within Tower Trail canopy gaps on Coleopteran diversity and density
Robert Coady, Paige Dennis, Kyle Webster, Brigitte Wierzbicki

On the Cranberry Lake Biological Station's Tower Trail, hay-scented fern (*Dennstaedtia punctilobula*) has established as a dominant understory plant in canopy gaps created by a 2006 forest tent caterpillar (*Malacosoma disstria*) outbreak. As hay-scented fern is known to limit forest succession by influencing forest floor microhabitat, it may have effects on the health of an ecosystem. Coleopterans serve many important ecosystem functions, therefore, assessing Coleopteran diversity and density can provide insight on the health of an ecosystem. Pitfall traps were set up at high, medium, and low density plots of hay-scented fern within three canopy gap sites. Soil pH, soil moisture, PAR (Photosynthetic Active Radiation), leaf litter depth, and plant composition readings were taken to account for variation in the soil microhabitat across fern densities. Based on the Shannon-Weiner Diversity Index, beetle diversity decreased with increasing hay-scented fern density. Additionally, there is no significant correlation between hay-scented fern density (percent cover/m²) and beetle density (individuals/m²). Therefore, higher density plots of hay-scented fern were found to have lower beetle diversity, and fern density and beetle density were found to not be significantly correlated. Combining all high, medium, and low density plots of hay-scented fern into separate experimental units at a distance of 1 km apart may better represent beetle ground movement.

Relationship between the diameter breast height and tree species with the presence of *Monotropa uniflora*
John Orgera, Otto Neiler, Siddharth Motwani, and Sarah Tyo

Monotropa uniflora, a myco-heterotrophic plant, indirectly parasitizing trees through their ectomycorrhizal relationship with the genus *Russula*. It was hypothesized that *M. uniflora* will be found near trees with a higher average diameter breast height (DBH) than trees found in control areas with no *M. uniflora*. Ten sample sites were taken by random point sampling at each of three different populations: Catamount Island, Albert Island, and the Forsaith Bog Trail. The average DBH (cm) of the ten nearest trees as well as the frequency of each species was recorded for each sample point. The control was determined by randomly selecting a *M. uniflora*-free area 15 m away from the sample site, for which average DBH and species were determined. A paired t-test was run on the comparative averaged DBH for the samples and control for each of the three experimental sites. These findings were significant for Catamount Island, but insignificant for Albert Island and Forsaith Bog Trail. The species tally at each sample and control was assessed using a chi-square test. All experimental sites were statistically significant for species proportion. There may be a correlation between *M. uniflora* and average DBH of trees. However, it may be location based or dominant species dependent. Further testing should include soil characteristics such as pH, mineral content, or organic content.