2016

Cranberry Lake Biological Station Research Symposium, Session C

SUNY College of Environmental Science and Forestry

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About EFB 202: Ecological Monitoring and Biodiversity Assessment

Ecological Monitoring and Biodiversity Assessment (EFB202) is 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.
Avian aggression levels in response to the Black-capped Chickadee (*Poecile atricapillus*) alarm call in edge habitats around Cranberry Lake Biological station

*Audrey Sellepack, Jenna Holakovsky, Alexandra Grove, Joseph Retelskyj*

**FIRST PLACE, SHIELDS RESEARCH AWARD**

Mobbing is an anti-predatory combination of various aggressive behaviors employed by birds to protect themselves and kin through expulsion of threats, as often seen by Black-capped Chickadees. We hypothesized mobbing bird species in edge habitats will exhibit more occurrences of aggressive behaviors, including high frequency calls and physical contact, in response to Black-capped Chickadee alarm calls than playbacks of Chickadee song, Blue-Jay (*Cyanocitta cristata*), and Red-eyed Vireo (*Vireo olivaceus*) alarm calls. We further hypothesized there would not be significant differences in bird aggression levels, measured by average fly-ins, between selected edge habitats. We used block sampling to construct three transects, containing four circular quadrats with 10-meter diameters, separated by 200-meters. Playback order was randomly selected for each quadrat, with one playback per day, over four days (n=48). We designed an exhaustive ethogram to log behaviors performed over 5-minutes of playback and 2.5-minutes of additional observation. We used a chi-squared test, for homogeneity of proportions to demonstrate differences in behavior from playbacks. It was determined there is a significant difference between playbacks. Furthermore, we performed an ANOVA test for homogeneity between habitats, which determined there was no significant difference between edge habitats. Data suggested Black-capped Chickadee calls elicit more occurrences of aggressive behaviors around Cranberry Lake Biological Station edge habitats.
Predatory Attacks on Cryptic vs Aposematic Colored Clay Lepidopteran Larvae
Candace Schermerhorn, Katie Tillapaugh, Michelle Vasiloff

Lepidopteran larvae play an important ecological role in the Adirondacks, as they serve as a vital food source for many organisms, especially fledgling birds. We sought to investigate how predatory attacks vary between cryptic and aposematic colored clay model caterpillars. Direct observation of predation on Lepidopteran in the field is found to be difficult due to speed and infrequency of attacks. In recent years the use of clay model caterpillars has been proven to be a successful method for monitoring predation. We expected that the rate of predatory attacks by birds, arthropods and mammals would occur more frequently on green cryptically colored clay models, compared to orange aposematic colored models. The type of predatory attack was assessed by the pattern of markings left on the clay caterpillars and placed into one of the three categories. We randomly selected starting points at three locations (Tower, Northside, and South Lake trail), and employed 300 m line transects with intervals every other 10 m containing our non-toxic clay models. Data was analyzed using a two sample t-test. Results showed there was not a significant difference between the rates of attacks on the two different colored models. Understanding these predator prey interactions may aid in future conservation efforts in light of recent disappearance of various Lepidopteran species in the northeast.
Macronvertebrate Diversity on Three Different Species of Floating Aquatic-Bed Macrophytes in Bay Areas of Cranberry Lake, NY

Zack Campbell, Cassie Rogers, Noah Scannell, Haley Welshoff, Amanda Cruty

Cranberry Lake is host to a variety of macrophytes, vital in structuring aquatic communities, in which species diversity of macroinvertebrates are dependent upon and will differentiate within (MacArthur and MacArthur 1961). Conventionally, macrophyte species production of epiphytic macroinvertebrates is determined by density; however, there is confliction regarding which types of macrophytes support greater macroinvertebrate diversity (Kirby, L. J., & Ringler, N. H. 2015). We surveyed four bays to determine the most frequently occurring macrophytes, and found that floating aquatic-bed macrophyte species were prevalent throughout. Water Shields (Brasenia schreberi), Wild Celery (Vallisneria americana), and Yellow Pond Lily (Nuphar luteum) were methodically chosen as our experimental units based on collective presence of all three species in each bay (replication), and sampled in an effort to find significant differences between macroinvertebrate diversity. Three 1m² plots were chosen based on minimal adjacent plant cover, with a range of depth between 1-2 meters, and sampled by sweeping with D-nets. ANOVA and Tukey tests were analyzed to find the differences in diversity between species. We found that, although differing, there was no observable statistical variance in macroinvertebrate diversity between floating aquatic-bed macrophyte species in any of our experimental sites (bays).

An Examination of Tardigrada Abundance in Various Freshwater and Terrestrial Substrates

Tyler Hodges, Colt Knoblauch, Maria Prieto, Hemanth Ramachandran

Tardigrades (phylum Tardigrada) are small, multicellular animals capable of surviving extreme conditions that are lethal to most other organisms. Tardigrades enter cryptobiosis, a type of dormancy, when conditions become unfavorable enabling them to survive for extended period of time. Adaptations such as this make them a popular study organism for both engineers and ecologists alike. It was hypothesized that freshwater substrates would have higher tardigrade abundance than terrestrial as they are prone to desiccation. Six substrates, 3 terrestrial and 3 freshwater, were examined to determine which substrate has the most tardigrade abundance. Nine samples, 0.5g each, were prepared from each of the six substrates. A total of 54 slides were prepared and examined to determine tardigrade abundance. For freshwater substrates, algae, liverwort and a freshwater sponge were tested. The terrestrial substrates tested were two different species of lichens and a species of moss. Student’s t-test was utilized to determine if there is a significant difference in tardigrade abundance between the two habitats. The results showed that the difference between the substrate types was significant, t(27) = 2.06, p = 0.003, between terrestrial (x̄ = 1.33 tardigrades/0.5g, σx = 2.09) and freshwater (x̄ = 0 tardigrade/0.5g, σx = 0). Both the null and alternate hypothesis were rejected, as terrestrial substrates were found to have more tardigrade abundance. These results will hopefully be useful in understanding the ecology of these organisms in the Cranberry Lake area.

A Comparison of the Diversity and Feeding Modes of Anisoptera and Zygoptera in Lotic and Lentic Waters

Abby Fowler, Brittany Emig, Rand Michaels, Nicole Heintz

Order Odonata is a subgroup of insects that includes both Anisoptera (dragonflies) and Zygoptera (damselflies). Different members of this order employ a variety of methods to
capture their prey of smaller flying insects. The presence of these organisms is an indicator of good ecosystem quality. We predicted a significant difference between diversity of dragonflies and damselflies in lotic and lentic waters. It was also hypothesized that there would be a significant difference between the various feeding modes of Odonates between lentic and lotic zones. Four sections of two streams that empty into Cranberry Lake were observed for one hour each to determine the taxonomic diversity and different methods of prey capture present in the adult Odonate communities of each habitat. A paired t-test was used to determine if there was a significant difference present in the feeding modes used between habitats. A Shannon-Wiener index was conducted which showed the lotic communities exhibited higher levels of diversity of Zygoptera, while the lentic habitats exhibited higher levels of diversity of Anisoptera. This relationship is likely related to the preference of Zygoptera toward perching feeding modes, and that of Anisoptera toward hawking shown using a two proportion test. The understanding of adult Odonate community structure is critical to the ability of ecologists and conservationists to assess the health of aquatic habitats.

**Distribution and Feeding Preferences of Sucker Brook Dolomedes tenebrosus**

Reminy Bacon, Charlotte Bernhard, Noah Garwood, Jade Skye Walker

There have been few studies on Adirondack populations of the dark fishing spider (*Dolomedes tenebrosus*), a nocturnal ambush predator that frequently hunts a variety of aquatic macroinvertebrates at the water’s edge. We set out to further understand the behavior and ecology of dark fishing spiders by determining which macroinvertebrates and microhabitats are preferred. Spiders were collected and observed in both fast and slow moving water sources. Size, location, and relative amount of sunlight exposure was recorded. Each spider was then placed in its own tank and exposed to three whirligigs and three water striders. Leg spans and body length of the marina and brook spiders were compared with two-sample t-tests with 95% confidence. We found that marina spiders are significantly larger than brook spiders in both body length and leg span. A two-sample test for proportions determined that significantly more spiders were found in the shade both in Sucker Brook and in the Cranberry Lake marina. Two Chi-Square test will be used to determine feeding preferences of the collected spiders. Our first trial (n=4), indicated that *D. tenebrosus* generally chose to feed on Gerrids before feeding on, and at higher frequencies, than Gyrinids. We expect our second trial (n=7), to reflect this same trend.

**Chemosensoory and Visual Detection of Natural Predatory Species in Aquatic Macroinvertebrates**

Hannah Roden, Kaylee Townsend, Marissa Schneider, Brianna Riesbeck

Macroinvertebrates are essential to the stream ecosystem; they inhabit the lower levels of the food chain, are prey of various aquatic consumers, and are important indicators of stream health. The hiding behaviors of Ephemeroptera, Odonata and Plecoptera specimens were observed while being exposed to chemical and visual stimuli of a common native predator, the Creek Chub (*Semotilus atromaculatus*). We predicted that members of Ephemeroptera and Plecoptera would exhibit more hiding behavior, in activity counts, when exposed to chemical cues than members of Odonata, and Odonata would exhibit higher amounts of hiding behavior, in activity counts, when exposed to visual cues. Behavior was observed when the test specimens were subjected to the visual of the fish, the infochemicals of the fish, then a
combination of both. Based on the Chi-Squared test, there was a significant difference in hiding behavior between Ephemeroptera (n=10), Plecoptera (n=9) and Odonata (n=10) when exposed to visual cues (p=0.048) but no significant difference between orders when exposed to chemical (p<.005), and combination treatments (p=0.199). These results indicate that Odonates have a more effective vision system than the other two orders, which has evolutionary, physiological, and social implications.

The Hunger Games of Botany - Comparison of Prey Capture Between Areas of High and Low Density of *Drosera rotundifolia* (round-leaved sundew)

MaryAnn Gonzalez, Anish Kirtane, Vanessa Lamot, Hunter Longenberger, Nicole Mlott

Sundews (*Drosera sp.*) are a characteristic species of carnivorous plant that grows in nutrient poor soils found in places such as bogs in North America. They capture arthropods using tentacles located on their leaves for additional nutrients. Understanding their diet has large implications for the conservation and management of their habitats. We hypothesized that sundews in low densities would have more prey per individual than in high densities and that *Collembola* would be caught more frequently than any other order. In this experiment twelve high (≥4 Individuals/m²) and low (≤ 4 Individuals/m²) density plots of sundews were chosen in each of the two bogs (24 plots total). On the first day captured prey was cleared from the leaves in order to track subsequent insect captures. The cleared prey was identified to order to estimate prey diversity. The number of prey captured on day two and three was tallied. The mean prey capture per individual in low density was 0.561 ± 0.085 and the high density was 0.427 ± 0.075. Data was analyzed for significance using a t-test (T=1.18, P=0.209, df=168). *Diptera* was found to be the most frequently caught order (40.7%). According to our results there is no statistical difference between high and low density and *Collembola* was not caught more frequently than any other order; we fail to reject both of our null hypotheses.

Determining factors of *Betula alleghaniensis* germination on nurse logs and soil in Cranberry Lake Biological Station

Margaret Gaylord, Olivia Iannone, Ashley Esengard, Emily Heifferon

Yellow birch is a key species in the diversity of Adirondack forests. As such, it is important to understand the basic requirements for seedling survival. Nurse logs often provide suitable environments for yellow birch seedlings. We hypothesize that this is due to larger moisture percentage in logs compared to that in soil. A higher percentage of canopy cover will lead to a higher number of yellow birch seedlings on both soil and logs due to higher moisture retention in dry summer conditions. Twenty different sites around CLBS were sampled. At each site, a plot of 1 m by 10 cm was used on both the log and soil. Measurements of seedling count, canopy cover percentage, organic layer depth, and soil texture were taken along with samples of both substrates. Samples were weighed, and dried to calculate the percent moisture. A t-test will be used to confirm the established difference in population density of yellow birch seedlings between logs and soil. Regression analysis will be used to find the relationship between the proportion of birch on logs compared to soil and relative moisture content of the two substrates. Regression will also be used to find a trend in effect of canopy cover on seedling density on each substrate. We expect to find a positive correlation between relative
moisture and seedling density on each substrate, and a positive correlation between percent canopy cover and number of seedlings on each substrate.

Wood Decay, Moisture, and Light Exposure Associated with Slime Mold Sporangial Development at Cranberry Lake Biological Station
Lisa Clarke, Aaliyah Jason, Jani Liu, Marcus Lopez, Kelsey McLaughlin

Slime molds (Amoebozoa, Mycetozoa) are unicellular organisms that congregate when resources within their substrates are limited. We speculated that intermediate decayed wood would be fibrous enough to hold water within the substrate. We then predicted that most slime mold genera are present on logs at the third stage of decay (wood soft outside, still structurally intact). We also suggested that logs with lower light exposure (lux) and higher percent soil moisture would support the greatest area of slime mold sporangia. We recorded the number of slime mold genera present on six levels of wood decay using a four-person timed meander. The decay rating system was based on a qualitative field assessment. We measured photon flux density and soil moisture associated with logs hosting Ceratiomyxa sporangia and measured area of the sporangial clusters on each log. Diversity amongst decay classes was compared using ANOVA and Tukey’s tests. We found that decay stage three had a significantly higher average genera present than any other class. Light and soil moisture were each compared to Ceratiomyxa area using regressions and had no relationship and a poor positive relationship with Ceratiomyxa area, respectively. Sporangial development may be influenced by factors outside of soil moisture and light intensity such as air exchange rate, pH, fungal presence, or weather.

Thamnophis sirtalis behavioral response to prey scent concentrations
Joey Wagner, Adrian Rouse, Brett Sherman, Rachel Guerrieri

Common garter snakes can be found throughout the Adirondacks and play a key role in limiting the populations of toads and other small animals that inhabit the park (Kalinowski 2011). It can be inferred that due to their size, the smaller snakes would display distinct foraging behaviors in comparison to their larger counterparts. They are notably more vulnerable to predators, which would likely motivate them to follow stronger concentrated scents that they can easily track. 12 snakes were evenly distributed into two groups based on their size: < 45 cm (small) and > 45 cm (large). A maze was constructed with one exit route and one dead end. A solution of night crawlers and water was synthesized and then diluted to form a 50% water: worm ratio. Three tests were run in the maze: a control (water), the 50% solution and a 100% solution. Each snake was allowed to run through the maze and was timed from start to finish. Each snake went through the maze twice per concentration for a total of 72 trials. Time, size and behavior of the snake was recorded for each trial. It was found that no matter the concentration, there was no significant difference for maze completion time with regard to chemoreception between large and small snakes.

Effects of Niche and Range Overlap on the Territoriality of Red-Eyed Vireos (Vireo olivaceus)
Alexandra Yattaw, Monica Banghart, Amy Wittmeyer, Phillis Kajita, Jacob Schreimer

Territoriality is a method of securing resources for an individual and its progeny which in songbirds is expressed by fly-ins, warning calls, and song. The greater the threat to its
resources, the higher the level of aggression that should be exhibited by the individual. Accordingly, individuals should be more aggressive towards species with greater niche and range overlap. We tested this in red-eyed vireos (*Vireo olivaceus*). We played the songs of a conspecific, a control (American Robin [*Turdus migratorius*]; different niche, same range), and three other vireos: white-eyed vireo (*Vireo griseus*; same niche, different range), Philadelphia vireo, (same niche and range), and yellow-throated vireo (*Vireo flavifrons*; same range, different niches) and recorded their behavior. Specifically, we recorded alarm calls, singing rates, fly-ins/initiation of singing and fly-out/termination of singing with sampling locations spaced a minimum of 150 meters. We expected the red-eyed vireos to react most strongly to conspecifics then to the Philadelphia vireo. We expected no response to white-eyed and yellow-throated vireos or American Robin. There was no significant difference between the average number of fly-ins or fly-aways between any of the songs played and no alarm calls were made in any trial. Only the American Robin elicited a significant increase in song rate.

**Substrate Preferences and Growth Rate of Stock, Quality, and Preferred Smallmouth Bass (*Micropterus dolomieu*) in Cranberry Lake**

_Sean Korbas, Timothy Squires, Jared Kline, Crew Stover, Caleb Konrad_

Smallmouth bass (*Micropterus dolomieu*) are a popular sport fish. Tests were performed to find a correlation between substrate type (rocky, woody, and grassy) and smallmouth bass population quality via proportional stock density (PSD). We hypothesized that quality and preferred fish will occur more often in areas whose substrate is rocky bottom. The experimental units are the three different substrates. They were each sampled seven times for a total of 21 sites. The sampling unit was smallmouth bass. Fish were caught using trap nets as well as hook and line. Substrates were classified by running a 30 meter transect, sites having 75% or more of one substrate were classified as that type. Length (cm), weight (g), and scales were collected for all smallmouth bass. Scales were used to determine fish age and growth rates while length and weights were used to find PSD value. A chi-square test was preformed to assess PSD values and their relationship between substrate types. A p-value of .474 with an alpha of .05 was found, which rejects our hypothesis. The length and weight relationship is represented by an exponential regression model, with an \( R^2 \) value of .8917. Results indicate which substrate smallmouth bass prefer. Information obtained can build upon the minimal studies performed regarding substrate preferences among smallmouth.

**The Application of the River Continuum Concept in Adirondack Streams**

_Kali Loughlin, Peter Rawinski, Daniel Sinopoli_

The River Continuum Concept (RCC) is a system used to predict biological diversity within flowing waters by observing their physical features and categorizing rivers into three different reach types; upper, middle, and lower. It has been observed that the streams around Cranberry Lake Biological Station have not followed the same reach trends that the RCC follows, placing the upper reach downstream from its average placement and the lower reach upstream from where it would normally be found. This study was set out to determine if fish and macroinvertebrate family diversity of Adirondack streams changes in a different pattern than that of the rivers that follow the RCC. Sucker, East, and Chair Rock Brook were measured for width, depth, velocity, dissolved oxygen, temperature, and substrate was observed to determine which section of stream would match each definition of the RCC’s upper, middle,
and lower reaches. Once each reach was determined, the family diversity of macroinvertebrates and fish was taken by kick-netting, placing minnow traps, and angling in each reach. Our results should fail to reject the null hypothesis, showing that higher family diversity is held in the same reach as the RCC would expect. Although the streams in the Adirondacks do not physically follow the characteristics of the RCC, the biodiversity trends remain consistent in each reach.