Eighteenth Annual

Graduate Student Symposium

January 20-21, 2012

Brought to you by:
The Ecology Graduate Students

Odum School of Ecology
The University of Georgia

Welcome and Acknowledgements

Welcome to the 18th annual Graduate Student Symposium (GSS) at the Odum School of Ecology! The Graduate Student Symposium (GSS) is organized by graduate students and serves as a medium to showcase ongoing student research at all stages of development. The goals of the symposium are to offer opportunities to give professional presentations, enhance communication between students and faculty throughout the University of Georgia, and provide a forum for interacting with a successful and prominent keynote alumnus or alumna.

This year's symposium could not have happened without the input of numerous graduate student volunteers on the following seven committees, and their roles in organizing this event are gratefully acknowledged!

- Program Committee: Sara Heisel, Tyler Kartzinel, Andrew Mehring, & Erica Teasley
- Poster Committee: Rachel King & Kelly Robinson
- Judging Committee: Sarah Budischak & Jessica Joyner
- Food & Beverage Committee: Peter Baas, Billy Bunch, Courtney Collins, & Troy Simon
- Souvenir Committee: Emily Cornelius, Mindy Edelson, & Stribling Stuber
- Prospective Student Committee: Alyssa Gehman, Linsey Haram, & Bill McDowell
- GSS Historians: David Manning & Jamie Winternitz

Many undergraduate and graduate students also cheerfully volunteered to serve as poster and presentation authors, session moderators, audio-visual coordinators, keynote chauffeurs, and countless other roles. Furthermore, faculty, post-docs, and students all contributed as presentation judges. The critical, yet friendly feedback obtained from these judges is one of the hallmark components of GSS, and one of the most beneficial elements of the event. Thank you all!

The staff of the Odum School of Ecology provides administrative and technical support throughout the event ranging from computer problems to event publicity to speaker arrangements. In particular, Katherine Adams, Beth Gavrilles, Brenda Mattox, Brian Perkins, & Bonita Wagers are to be acknowledged with highest praise!

Finally, we thank you for making time out of your busy schedule to attend the event. We hope you will not only hear something new, but will also provide feedback to the student participants, enjoy yourself, and consider contributing next year!

Sincerely and Gratefully,
Kimberly Kellett & Kyle McKay
2012 Graduate Student Symposium Coordinators

History of the Graduate Student Symposium

The Institute of Ecology Graduate Student Symposium was founded in 1995 by Janice Sand, Liz Kramer, Bob Hall, and Anne Dix as an outlet for graduate students to give oral presentations in preparation for national and international meetings. The first symposium involved approximately 10 student presentations on rotary slide trays from 35mm film developed in Ecology's dark room! Presentations were followed-up with a convivial potluck dinner. The success of GSS was immediately apparent with all involved having a great time and students winning presentation awards at national meetings! Other academic units at the university soon followed suit by establishing their own student symposia.

The event has grown in popularity and size over the years as the Institute has morphed into the Odum School of Ecology. In 1996, a keynote lecture was invited to the event, and soon thereafter it was decided that the keynote should be an alumna or alumnus of the UGA ecology program. Faculty, post-doctoral researchers, and graduate peers were enlisted to provide friendly feedback on presentations. An undergraduate poster session was established after ecology began a bachelor's degree program. Meals and coffee breaks were catered by local eateries to keep bellies full and attendees alert. Prospective students were soon invited the week of GSS to "get a feel for what ecology is all about." Additional administrative roles were needed to adjust to a growing symposium, and conference committees were organized to take care of invited speakers, program and scheduling, judging, food and drink, prospective student housing, and souvenirs. The table below lists *some* of the people who have been instrumentally involved in GSS.

Year	GSS Organizer(s)	Keynote Speaker	Affiliation at the time
1995	Janice Sand, Liz Kramer, Bob Hall, Anne Dix	None	n/a
1996	Janice Sand, Patty Saunders, Karen Bushaw, Elaine Hardwick, Jen Tougas	Rebecca Sharitz	Savannah River Ecology Laboratory
1997	Larkin Powell	Ronald Pulliam	National Biological Service
1998	Unknown	Unknown	Unknown
1999	Alice Miller	Karen Holbrook	Provost, University of Georgia
2000	Theresa Thom	Karen Kind Eckert	Wider Caribbean Sea Turtle Conservation Network
2001	Laura England	H. Kay Austin	International Joint Commission
2002	Unknown	Jack Webster	Virginia Polytechnic Institute
2003	Dawn Drumtra, Stephanie Madson	Jianguo (Jack) Liu	Department of Fisheries and Wildlife, Michigan State University
2004	Gretchen L. Peltier	Peter Groffman	Cary Institute of Ecosystem Studies
2005	John Kominoski, Caralyn Zehnder	Carol Couch	Georgia Department of Natural Resources
2006	Chrissa Carlson, Carol Flaute	William Cale	University of North Alabama
2007	Andrew Mehring, Sonia Harnendez	Johnathan Ambrose	Georgia Wildlife Resources Division
2008	Ching-Yu Huang, Chip Small	Nick Haddad	North Carolina State University
2009	Dean Hardy, Jamie Winternitz	Evelyn Gaiser	Florida International University
2010	Jessica Joyner, Shafkat Khan	Elizabeth Anderson	Field Museum of Natural History
2011	Peter Baas, Megan Machmuller	Ned Gardiner	National Oceanic and Atmospheric Administration

This year marks the 18th annual Graduate Student Symposium, and we hope the tradition continues well into the future.

Viva la GSS!

Schedule of Events Friday Morning

800	830	Morning Coffee	
Session I		Moderator	Kyle McKay
830	845	Dr. John Gittleman	WELCOMING REMARKS
845	900	Kimberly Kellett	DEMOGRAPHY IN DRIER STATES: SEASONAL FLUCTUATIONS OF TROPICAL MILKWEED POPULATIONS
900	915	Julie Rushmore	SOCIAL NETWORK ANALYSIS WITH INSIGHTS FOR DISEASE TRANSMISSION DYNAMICS IN WILD CHIMPANZEES
915	930	Jessica Joyner	ENTERIC BACTERIA RELEASED BY BATHING TOURISTS IN THE DRY TORTUGAS NATIONAL PARK, FLORIDA
930	945	Jake Allgeier	FISHING DOWN NUTRIENTS: ALTERING CORAL REEF ECOSYTEMS FROM THE BOTTOM UP
945	1000	Kelly Robinson	LONG TERM LAND USE MANAGEMENT PLAN FOR THE WHARTON CONSERVATION CENTER
1000	1030	Coffee Break	
Session II		Moderator	Sarah Bowden
1030	1045	Ethan Epps	LET THE RIGHT ONE IN: MECHANISMS CONTROLLING SYMBIONT SPECIFICITY IN CNIDARIANS
1045	1100	Alexa Fritzsche	DOES VARIATION IN BEHAVIOR AND IMMUNE INVESTMENT LEAD TO PARASITE SUPERSPREADERS IN THE THREESPINE STICKLEBACK?
1100	1115	Andrew Mehring	EXTENSION OF OXIC PERIODS BY BRYOPHYTES ON BUTTRESSED TRUNKS AND KNEES OF BALDCYPRESS
1115	1130	Keri Goodman	ACTIVATED CHEMICAL DEFENSES SUPPRESS HERBIVORY ON FRESHWATER RED ALGAE
1130	1145	Tyler Kartzinel	ECOLOGICAL CONSEQUENCES OF THE EVOLUTIONARY PROCESS IN A NEOTROPICAL EPIPHYTIC ORCHID
1145	1200	Kyle McKay	IDENTIFYING THRESHOLDS IN ECOLOGICAL RESPONSE TO RIVER DISCHARGE USING EFFECTIVENESS ANALYSIS
1200	130	POSTER SESSION	Lunch catered by Big City Bread: Vegetarian sandwich platters with humus, mozzarella and tomato, and grilled mushroom with swiss.

Schedule of Events Friday Afternoon

Session III		Moderator	Rachel Katz
130	145	Jeremy Sullivan	SOUTHERN APPALACHIAN STREAM VISUAL ASSESSMENT PROTOCOL PROTOCOL (saSVAP): THE CUSTOMIZATION OF A STREAM VISUAL ASSESSMENT PROTOCOL FOR THE SOUTHERN APPALACHIAN REGION
145	200	Sarah Budischak	LAB EXPERIMENTS WITH BUFFALO ARE A BAD IDEA: INVESTIGATING CO-INFECTION INTERACTIONS IN A MODEL SYSTEM
200	215	Erica Teasley	INCIDENCE OF WEST NILE VIRUS IN MOSQUITOES AND TURTLES IN REFERENCE AND AGRICULTURAL WETLANDS IN SOUTHWESTERN GEORGIA
215	230	Tad Dallas	EFFECTS OF COMPETITION AND SELECTIVE PREDATION IN A TWO-HOST SYSTEM
230	245	Alyssa Gehman	SENSITIVE INTERACTIONS: AN INVASIVE CASTRATING PARASITE AND ITS RESPONSE TO CLIMATE CHANGE IN GEORGIA'S ESTUARIES
245	300	Jenna Malek	THE EFFECTS OF AIR-EXPOSURE STRESS GRADIENTS ON THE SPATIAL PATTERNS OF DISEASE IN THE EASTERN OYSTER, CRASSOSTREA VIRGINICA
300	330	Coffee Break	
Session IV		Moderator	Jake Allgeier
330	345	Troy Simon	EVOLUTIONARY AND ECOLOGICAL EFFECTS OF TRINIDADIAN GUPPIES ON ECOSYSTEM STRUCTURE IN NATURE: A NATURAL EXPERIMENT
345	400	Rachel King	SPATIAL AND DIET ANALYSIS OF FRESHWATER AQUATIC TURTLES IN COASTAL PLAIN OF GEORGIA
400	415	Andrea Ayala	EFFECTS OF HELMINTH CO-INFECTION ON MICROPARASITE SUSCEPTIBILITY AND INFECTIOUSNESS IN A MODEL ROCK PIGEON (COLUMBA LIVIA) SYSTEM
415	430	Gina Botello	LARVAL MOSQUITO ASSEMBLAGES IN AGRICULTURAL WETLANDS OF SOUTHWESTERN GEORGIA: INVESTIGATING THE INFLUENCE OF SURROUNDING LAND USE AND NUTRIENT ENRICHMENT
430	445	Jamie Winternitz	CHARACTERIZING IMMUNE GENE DIVERSITY IN MONTANE VOLES (MICROTUS MONTANUS) AND TESTING FOR EVIDENCE OF BALANCING SELECTION
445	500	Pedro Torres	DAMMING EFFECTS ON NUTRIENT DYNAMICS IN TROPICAL HEADWATER STREAMS
515	700	POSTER SESSION	Refreshments and light fare provided.

Schedule of Events Saturday Morning

830	900	Morning Coffee	
Session V		Moderator	Shafkat Khan
900	915	Linsey Haram	SHIFTING ECOSYSTEMS: EFFECTS OF MULTIPLE HUMAN-INDUCED STRESSORS ON ESTUARINE COMMUNITIES IN THE SOUTH ATLANTIC BIGHT, USA
915	930	Rebeca De Jesus	EVALUATING STREAM INTEGRITY IN COFFEE AGROFORESTRY SYSTEMS ACROSS A GRADIENT OF LANDSCAPE VARIABLES
930	945	Billy Bunch	GEOGRAPHIC AND SOIL NUTRIENT LINKS IN THE MYCORRHIZAL ASSOCIATION OF A RARE ORCHID, CYPRIPEDIUM ACAULE
945	1000	Marcus Zokan	TWO NEW SPECIES OF CHYDORUS (CRUSTACEA: CLADOCERA) FROM THE SAVANNAH RIVER SITE, SOUTH CAROLINA
1000	1015	Sarah Bowden	MODELING DISEASE DILUTION AND AMPLIFICATION IN A MULTI-HOST, MULTI-VECTOR SYSTEM
1015	1030	Phillip Bumpers	PREDICTING THE RESPONSE OF SALAMANDERS TO NUTRIENT ENRICHMENT OF HEADWATER STREAMS
1030	1045	Coffee Break	
Session VI		Moderator	Carrie Keogh
1045	1100	Emily Cornelius	INTERPLAY BETWEEN STRESS, LIPIDS, PARASITES AND IMMUNITY IN MIGRATING SONGBIRDS
1100	1115	Peter Baas	UTILIZATION OF WATERSHED SCALE SOIL MOISTURE, NUTRIENT AND TEXTURE DYNAMICS: POSSIBILITIES FOR QUANTIFYING NITROGEN CYCLING “HOTSPOTS”
1115	1130	Casey Harris	THE ROLE OF ALGAE IN REGULATING DISSOLVED OXYGEN LEVELS IN BLACKWATER STREAMS DRAINING GEORGIA’S COASTAL PLAIN
1130	1145	Josh Lobe	THE EFFECT OF INVASIVE CHINESE PRIVET ON EARTHWORMS
1145	1200	Kristy Segal	AMPHIBIAN COMMUNITY COMPOSITION AND HEALTH IN RICE FIELDS IN COSTA RICA
1200	200	Lunch on your own: Transportation will be provided to Taste of India and Thai Spoon for prospective students.	

Schedule of Events Saturday Afternoon

Session VII		Moderator	Kathleen Rugel
200	215	Bill McDowell	MODELING CURRENT AND FUTURE POTENTIAL RANGES OF INVASIVE SPECIES
215	230	Shannon Bonney	INTERSTATE INSTITUTIONAL ARRANGEMENTS FOR INTEGRATIVE WATERSHED MANAGEMENT AND THEIR APPLICABILITY TO THE APALACHICOLA CHATAHOOCHEE FLINT BASIN
230	245	Megan Machmuller	BELOWGROUND CARBON TRANSFORMATIONS IN RESPONSE TO SOIL WARMING
245	300	Dara Satterfield	EFFECTS OF ALTERED HOST MIGRATION ON PARASITE EVOLUTION
300	315	Courtney Collins	COMPARING THE FUNCTIONAL TRAITS OF LIANAS AND TREES IN A LOWLAND TROPICAL FOREST: GETTING TO THE "ROOT" OF THE ISSUE
315	330	Carrie Keogh	LOCAL ADAPTATION OF MARINE SNAIL HOSTS TO TREMATODE PARASITE ATTACK
330	345	Coffee Break	
Session VIII			
345	400	Dr. Cathy Pringle	INTRODUCTION OF DR. MATT WHILES
400	500	Dr. Matt Whiles	ASSESSING THE CONSEQUENCES OF DECLINING FRESHWATER BIODIVERSITY: IMPACTS OF CATASTROPHIC AMPHIBIAN DECLINES ON CENTRAL AMERICAN STREAMS
500	800	Reception: Mediterranean suisine catered by Donderos Kitchen: vegetarian moussaka, Kazim's chicken, Turkish white bean salad, and Mediterranean salad.	

Plenary Speaker

DR. MATT R. WHILES

Director, Center for Ecology

Southern Illinois University – Carbondale

PhD, 1995, University of Georgia, Ecology

MS, 1991, University of Georgia, Entomology

BS, 1988, Kansas State University, Biology

ASSESSING THE CONSEQUENCES OF DECLINING FRESHWATER BIODIVERSITY: IMPACTS OF CATASTROPHIC AMPHIBIAN DECLINES ON CENTRAL AMERICAN STREAMS

Ongoing amphibian declines represent significant reductions in consumer diversity, which can alter ecosystem processes. Disease-driven declines in high diversity tropical streams result in significant changes to ecosystem structure and function, including increased algal biomass and organic sediment accumulation, reduced nitrogen uptake and cycling rates, reduced system respiration, and declines in riparian predators. Despite positive responses by some consumer groups, there is no evidence for functional redundancy or compensation.

When: Saturday, January 21, 2012, 3:45-5:00 PM
Where: Odum School of Ecology, Auditorium

Oral Presentations

FISHING DOWN NUTRIENTS: ALTERING CORAL REEF ECOSYTEMS FROM THE BOTTOM UP

Jacob E. Allgeier[1], Craig A. Layman [3], Peter J. Mumby[2], and Amy D. Rosemond[1]
[1]Odum School of Ecology, University of Georgia, Athens, Georgia, USA
[2]Marine Spatial Ecology lab, University of Queensland, Brisbane, Australia
[3]Department of Biological Sciences, Florida International University, North Miami, Florida

Effective management of marine fisheries has emerged as one of the world's foremost conservation challenges. While implications of overharvesting marine fisheries have been well studied, particularly from the top-down perspective, i.e. trophic cascades associated with the removal of top predators, alternative frameworks may be necessary to provide a more complete understanding of the ecosystem-level consequences of this perturbation. Animals play an important role in the cycling (via excretion) and retention (via biomass) of nutrients at the ecosystem scale, with important feedbacks on primary production. These processes are critical in oligotrophic ecosystems with relatively little allochthonous nutrient input and high animal biomass, such as coral reefs. Using a Bayesian approach, we combined bioenergetics modeling with empirically derived excretion rates and body stoichiometry from 875 individual fish and invertebrates, including 92 species, to estimate nutrient storage and flux by coral reef fishes. These findings were modeled onto datasets of community composition of coral reef fishes in marine protected areas and adjacent non-protected areas in The Bahamas archipelago. Because species deviate substantially in the amount of nutrients they recycle and store, this approach reveals that overfishing via alteration of population size and community composition decreases the capacity at which the ecosystem can store and cycle nutrients, a ramification that would otherwise be overlooked using biomass and/or abundance measurements alone. Reductions in this nutrient capacity of an ecosystem may have important legacy effects on coral reefs whereby long-term constraints on primary production may reduce secondary production with important implications for fisheries management and conservation.

EFFECTS OF HELMINTH CO-INFECTION ON MICROPARASITE SUSCEPTIBILITY AND INFECTIOUSNESS IN A MODEL ROCK PIGEON (*COLUMBA LIVIA*) SYSTEM

Andrea J. Ayala[1] and Vanessa O. Ezenwa[1]
[1]Odum School of Ecology, University of Georgia, Athens, GA

Emerging diseases are rapidly becoming a global conservation issue, and traditional approaches to understanding transmission among in-situ populations often involved investigating hosts in the context of a single pathogen. Yet it is clear now that understanding disease dynamics within ecological frameworks must address hosts as simultaneously infected with multiple organisms. Helminths are among the most common parasites of vertebrates, yet their impact on host populations are underappreciated due to their typical sublethal and/or subclinical effects. However, helminths may indirectly play a central role in the spread of other virulent pathogens, including many microparasites (e.g. viruses, bacteria). These indirect effects occur because pre-existing helminth infections can suppress host immunity in ways that increase microparasite susceptibility and enhance infectiousness, two key parameters that influence microparasite transmission. My study will use free-ranging urban Rock Pigeons naturally exposed to both gastrointestinal helminths and Pigeon Paramyxovirus-1 virus (PPMV-1) to examine the implications of helminth co-infection for microparasite transmission. To determine the extent to which helminths may affect the transmission of PPMV-1 in wild birds, I will test whether anthelmintic treatment alters viral seroconversion (susceptibility) and viral shedding (infectiousness) rates. I predict that treated pigeons will have lower antibody seroconversion rates and lower levels of viral shedding, reducing their overall contribution to PPMV-1 transmission. Significantly, this study will explore the dynamics of helminth co-infection in a peridomestic species not only host for a wide range of pathogens, but also closely tied to anthropogenic landscapes.

UTILIZATION OF WATERSHED SCALE SOIL MOISTURE, NUTRIENT AND TEXTURE DYNAMICS: POSSIBILITIES FOR QUANTIFYING NITROGEN CYCLING "HOTSPOTS"

Peter Baas[1], Jacqueline Mohan[1], Daniel Markewitz[2], and Jennifer D. Knoepp[3]
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[2]Warnell School of Forestry and Natural Resources, University of Georgia, Athens, GA
[3]USDA Forest Service, Southern Research Station, Coweeta Hydrologic Laboratory, Otto, NC

The high level of spatial and temporal heterogeneity in nitrogen cycling hinders our ability to develop an ecosystem-wide understanding of this cycle. Determining nitrogen cycling "hotspots" has proved to be very complicated. In the southern Appalachians nitrogen cycling is highly dependent on elevation. In this study novel techniques to assess nitrogen cycling hotspots in sites along an elevation gradient were used. These non-destructive techniques include EMI (electromagnetic induction) to estimate soil moisture and texture patterns and NIRS (near infrared reflectance spectroscopy) to determine soil organic carbon and nitrogen content. Potential denitrification and potential nitrification were determined on soil cores (20 cm deep) as indicators of nitrogen cycling. The site at the highest elevation had significantly greater %C and %N ($p<0.05$) and all sites were highest at the soil surface (0-5 cm depth; $p<0.0001$). Overall, NIRS data was able to explain 40% of the potential denitrification rates ($p<0.01$). EMI was able to explain between 20%-52% (site specific) of the variability in soil moisture without having a direct relationship with potential process rates. Both NIRS and EMI proved to be promising tools in elucidating nitrogen cycling hotspots.

INTERSTATE INSTITUTIONAL ARRANGEMENTS FOR INTEGRATIVE WATERSHED MANAGEMENT AND THEIR APPLICABILITY TO THE APALACHICOLA CHATAHOOCHEE FLINT BASIN

Shannon N. Bonney[1], Chad W. Bickerton[2], Laurie Fowler[1], Steve Leitman[3], Thomas T. Ankersen[2], Richard G. Hamann[2], Hollie R. Hall[4], and Sam Fowler[5]
[1]Odum School of Ecology, University of Georgia, Athens, GA
[2]Levin College of Law, University of Florida, Gainesville, FL
[3]Institute for International Cooperative Environmental Research, Florida State University, Tallahassee, FL
[4]Center for Environmental Policy, University of Florida, Gainesville, FL
[5]Water Resources Center, Auburn University, Auburn, AL

Balancing the needs of a wide array of water users while also leaving enough water for ecosystems is a difficult undertaking. This task is further complicated by the fact that watersheds do not necessarily follow political boundaries, often crossing into multiple jurisdictions. Moreover, our demands for water are growing and all the while our climate is changing (possibly leading to more dramatic and unpredictable systems). The Apalachicola-Chattahoochee-Flint Basin has been struggling to balance human and ecosystem needs for decades. The three states composing the basin (Georgia, Florida, and Alabama) have been in and out of the courtroom since the 1980's. Stakeholders representing the full spectrum of interests have come together and are looking for innovative ways to sustainably use these waters through collaboration rather than through endless litigation. This is a high stakes endeavor: millions of people rely on the basin for drinking water, vast agricultural fields are irrigated with these waters, and multiple endangered species are directly affected by the flow regime. A coalition of universities in the three states are collaboratively researching existing institutions that are managing interstate watersheds. Based on a synthesis of this research we are going to recommend to the ACF stakeholders institutional arrangements that would facilitate a sustainable watershed management plan.

LARVAL MOSQUITO ASSEMBLAGES IN AGRICULTURAL WETLANDS OF SOUTHWESTERN GEORGIA: INVESTIGATING THE INFLUENCE OF SURROUNDING LAND USE AND NUTRIENT ENRICHMENT

Gina Botello[1,2], Stephen Golladay[1,2], and Alan Covich[1]
[1]Odum School of Ecology, University of Georgia, Athens, GA
[2]J.W. Jones Center of Ecological Research, Newton, GA

Isolated wetlands are extensively drained and altered by urbanization, forestry and agriculture. These landscape changes could affect the assemblages of larval mosquitoes that occupy these wetland habitats. Most mosquito surveillance is concentrated in urban areas and little observational data of mosquito assemblages are available from rural areas of the southeastern U.S. The expansion of mosquito-borne disease has increased the need to determine how anthropogenic disturbances such as altered wetland conditions influence mosquito ecology. This research used wetland surveys and field-based mesocosms during extreme drought conditions in January-December of 2011 to test how surrounding land use and nutrient enrichment influence larval mosquito assemblages in agriculturally influenced and reference wetlands typical of southwestern Georgia. Preliminary results using an Indicator Species Analysis revealed that *An. quadrimaculatus*, *Cx. erraticus*, *Ps. columbiae*, and *Cx. salinarius*, were indicators of agricultural wetlands, while *Cx. territans*, *An. crucians*, and *Oc mitchellae* were indicators of reference wetlands. In field-based mesocosms receiving fertilizer treatments, *Cx. territans* was more abundant and positively correlated with stem density (r^2= 0.717, p=0.0452), while *Cx. salinarius* was more abundant in unfertilized mesocosms and negatively correlated with plant height (r^2= -0.700, p= 0.0533). These results suggest distinct habitat preferences for mosquito species, which could make them useful bioindicators of wetland condition, which is important in predicting the prevalence of potential disease carrying mosquitoes.

MODELING DISEASE DILUTION AND AMPLIFICATION IN A MULTI-HOST, MULTI-VECTOR SYSTEM

Sarah Bowden[1] and John Drake[1]
[1]Odum School of Ecology, University of Georgia, Athens, GA

The importance of biodiversity at global, regional, and local scales to ecosystem health and function is becoming increasingly evident in the ecological and biological sciences. Biodiversity provides key ecosystem services, promotes ecosystem, human, and wildlife health, and can even provide a buffer to the introduction and spread of infectious diseases. Specifically, high host diversity is known to decrease transmission of vector-borne pathogens, a phenomenon known as the dilution effect. In recent studies, the effects of biodiversity on disease systems have been explored primarily with respect to the host community. However, previous research has shown that for an ecologically and epidemiologically important multi-host/multi-vector pathogen, West Nile Virus (WNV), vector distribution best predicts human disease. It follows, then, that we should explore the effects of biodiversity on pathogen transmission in the vector community as well as in the host community. Since I propose that both host *and* vector diversity may play a part in disease dilution, I will create a stochastic, discrete-time, multi-host/multi-vector model to compare epidemic sizes generated by a multi-host/single-vector model to those generated by a multi-host/multi-vector model to determine how the inclusion of vector diversity alters the dynamics of the epidemic. Species evenness (a component of diversity) in the host and vector communities and competence (ability to transmit the pathogen) of each species will be manipulated to demonstrate epidemic dynamics under various realistic scenarios.

LAB EXPERIMENTS WITH BUFFALO ARE A BAD IDEA: INVESTIGATING CO-INFECTION INTERACTIONS IN A MODEL SYSTEM

Sarah Budischak[1], Olakekan Kamau-Nataki[1], Lindsey Megow[1], Nidhi Patel[1], Brandon Bringuel[1], Llewelyn Sellers[2], Kaori Sakamoto[2], and Vanessa Ezenwa[1,3]
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[2]Department of Pathology, College of Veterinary Medicine, Athens, GA
[3]Department of Infectious Diseases, College of Veterinary Medicine, Athens, GA

Most animals are concurrently infected with multiple parasites. Interactions among parasites in a single host may affect infection duration, infectiousness, and pathology. A handful of studies show the potential of co-infection interactions to affect both disease dynamics and host fitness, but the consequences of co-infection are difficult to measure because of the dynamic nature of host-parasite interactions. For example, single time-point studies cannot determine the order of infection, the timing of immune responses, and the relationships among body condition, susceptibility, and infection. As such, longitudinal and experimental studies are needed to determine the consequences of co-infection to the host. My dissertation research combines a large-scale, longitudinal study of African buffalo (*Syncerus caffer*) with laboratory experiments using mice to examine: (1) if host condition influences susceptibility to macro-and micro-parasites, (2) how macro-parasite community composition affects host condition and immune function, and (3) if macro-parasite community composition influences susceptibility to micro-parasite infection. I will outline my experimental plans and present the results of a preliminary trial where we examined the effects of GI helminth community composition on host condition and immune function in laboratory mice (C57BL/6).

PREDICTING THE RESPONSE OF SALAMANDERS TO NUTRIENT ENRICHMENT OF HEADWATER STREAMS

Phillip Bumpers[1], Amy Rosemond[1], John Maerz[2], John Kominoski[1], and Jonathan Benstead[3]
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[2]Warnell School of Forestry and Natural Resources, University of Georgia, Athens, GA
[3]Department of Biological Sciences, University of Alabama, Tuscaloosa, AL

In Southern Appalachian headwater streams, salamanders are top predators that differ in their diet composition and body nutrient content. We are testing the effects of nutrient enrichment on growth and diet composition of two dominant salamanders (*Desmognathus quadramaculatus* and *Eurycea wilderae*) by experimentally enriching 5 streams with different ratios of nitrogen (N) and phosphorus (P), ranging from 2:1 to 128:1. Pre-treatment data on salamander diets are being used to predict their responses to the relative loadings of N and P, such that occur with different types of land use change. Diets for *D. quadramaculatus* were identified to genus and averaged for % abundance across all 5 streams. *E. wilderae* diet composition was estimated from published data. *D. quadramaculatus* feeds more on predator invertebrate species and E. wilderae specializes more on invertebrates that consume fine particulate organic matter (collectors). The organic matter resources for these invertebrates are predicted to be differentially affected by nutrient enrichment (e.g., shredders > collectors > predators) but differ based on N:P availability. Thus, differential effects of N:P enrichment are predicted for *D. quadramaculatus* and *E. wilderae*. The predictions for these top vertebrate predators will facilitate overall predictions for headwater ecosystems to nutrient enrichment.

GEOGRAPHIC AND SOIL NUTRIENT LINKS IN THE MYCORRHIZAL ASSOCIATION OF A RARE ORCHID, *CYPRIPEDIUM ACAULE*

William D. Bunch[1] and Richard P. Shefferson[1]
[1]Odum School of Ecology, University of Georgia, Athens, GA

Mycorrhizae are a requirement for the germination of orchids in nature. Most conservation efforts have not taken the specialization of mycorrhizal hosts into account when designing management and restoration strategies for rare orchids. Without an adequate understanding of how variability in mycorrhizal host selection is associated with habitat and soil characteristics, current management strategies for rare orchids could potentially lead to diminishing abundance and distribution of these rare plants. This project was conducted with two main goals: 1) gain insight into how orchid-host interactions are maintained across broad geographic areas as opposed to within select, local populations and 2) determine patterns in mycorrhizal host specialization associated with soil nutrient conditions. Fifteen populations were sampled across middle and northern Georgia. Soil samples were taken at the site of each plant in order to determine total carbon, total nitrogen, ammonium, nitrate, pH, and calcium content. Mycorrhizal hosts of these plants were identified from root samples using DNA analysis of key fungal barcoding genes. The results suggest that *C. acaule* associates with a wide range of fungi, but is most commonly found associating with Tulasnella and Russula species. Principal component analysis revealed that *C. acaule* is more likely to associate with Tulasnella species than Russula species at lower elevations and in soils with higher concentrations of ammonium.

COMPARING THE FUNCTIONAL TRAITS OF LIANAS AND TREES IN A LOWLAND TROPICAL FOREST: GETTING TO THE "ROOT" OF THE ISSUE

Courtney Collins[1], Nina Wurzburger[1], Joe Wright[2], Stefan Schnitzer[2], Ben Turner[2], and Kelly Andersen[1]
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The tropical forest biome stores nearly half of the world's living terrestrial carbon (C) and therefore, any changes in its structure and function will have major implications for the global climate system. Over the past 30 years, lianas, or woody vines, have become more dominant in neotropical rainforests. An increase in liana biomass may have significant impacts on the biogeochemical processes of these forest ecosystems, including water and nutrient cycling. Many gaps exist in our knowledge about how and why lianas are increasing. I seek to address this important issue by analyzing and comparing the functional traits (organismal features related to fitness) of lianas and trees. My proposed work will emphasize a particularly understudied aspect of plant functional traits: fine roots. I will sample pairs of trees and lianas in the same family and soil type to determine if there are differences in the functional traits of each growth form. I will also look for relationships between the above and below ground functional traits of lianas versus trees. I hypothesize that lianas may have a more flexible C budget than do trees because they do not create their own support structures. Thereby, liana functional traits may reflect this flexibility, and point towards strategies for growth that may provide an ecological advantage over trees. My goal is to delineate specific traits or trait relationships that may be associated with increasing liana establishment and survival in order to better understand how lianas will continue to affect tropical biogeochemical cycles in the future.

INTERPLAY BETWEEN STRESS, LIPIDS, PARASITES AND IMMUNITY IN MIGRATING SONGBIRDS

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Animal migrations are among the world's most fascinating phenomena and often require immense physical endurance and energetic resources. Past work has suggested that prior to and during migratory journeys, animals might divert resources away from immunity and other bodily functions and towards fat storage and muscle to prepare for long distance movement. However, relatively few studies have examined tradeoffs involving immune defense and lipid reserves during migration. The goal of my study is to examine the potential relationships between stress, fat stores, parasitism, and immune defense in migratory songbirds at a stopover site in coastal Georgia. Starting in Fall 2011, I captured songbirds and visually scored subcutaneous fat levels, collected blood samples for white blood cell and parasite screening, and collected fecal samples for measuring corticosterone (stress hormone) metabolites. Analysis of these samples is underway, focusing on the most commonly encountered species. I predict that birds with low lipid scores should have high stress levels, that parasitized individuals may show low levels of fat and high measures of stress, and that across all animals sampled, measures of immune defense should correlate negatively with fat scores. By the time of this presentation white blood cell counts and hemoparasite levels will be quantified. The findings will further our understanding of host-parasite interactions and the energetic and physiological tradeoffs that surround migration.

EFFECTS OF COMPETITION AND SELECTIVE PREDATION IN A TWO-HOST SYSTEM

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Disease ecology has a tradition of focusing on the interactions between one host species and one disease. Only recently has focused shifted to incorporate multiple hosts or the potential for co-infection with multiple diseases. Competition among hosts and selective predation of infected individuals are two often neglected potential drivers of disease dynamics in ecological communities. A two-host Susceptible-Infected (SI) model was created on top of a Lotka-Volterra competition model using data from infections of *Daphnia dentifera* by a fungal pathogen (*Metschnikowia bicuspidata*). Two scenarios were analyzed; 1) hosts have equal competitive ability and 2) one host is competitively superior. Equal competition resulted in decreasing disease prevalence and number of susceptibles. When one host dominates competitive interactions, maximum prevalence values do not differ between species, but the number of susceptibles decreases at high levels of competitive difference. Selective predation results in lower maximum prevalence values and dynamics similar to those of the disease-free state. These results support the importance of selective predation and competition in contributing to disease dynamics.

EVALUATING STREAM INTEGRITY IN COFFEE AGROFORESTRY SYSTEMS ACROSS A GRADIENT OF LANDSCAPE VARIABLES

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In this work we present preliminary data on a stream survey conducted this past summer in 22 streams draining coffee farms and 2 reference streams in Costa Rica. During the survey we assessed habitat quality using the USDA Stream Visual Assessment Protocol (SVAP) and bio-integrity using benthic macroinvertebrates as indicators. These parameters were compared with landscape data including riparian condition, canopy cover, discharge and slope. The purpose of this survey was to a) determine if coffee agriculture has a negative effect on stream integrity, and b) determine if this effect varies with landscape factors. Also, we compare results of the SVAP and the bio- integrity data to evaluate the applicability of the SVAP as a tool for rapid stream monitoring within coffee farms, and suggest possible modifications to improve its predictive power. The results of this survey will help guide a research project that seeks to explore the ecological services to water quality provided by coffee-agroforestry systems. Our overall goal is to use this information to develop guidelines for sustainable coffee production with a focus on stream protection. These guidelines will be used to make recommendations to nonprofit organizations such as the *Rainforest Alliance*, who provide sustainable certifications to coffee farms, as the existing certification standards lack a comprehensive approach for managing aquatic ecosystems.

LET THE RIGHT ONE IN: MECHANISMS CONTROLLING SYMBIONT SPECIFICITY IN CNIDARIANS

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Young coral polyps often find themselves colonized by a diverse array of Symbiodinium dinoflagellates. As the host matures, the population of algae within it narrows to the species' preferred symbiont. These relationships are highly specific and highly deterministic; different populations of the same coral species demonstrate remarkable fidelity to their favorite alga, and these preferences are believed to be the outcome of long-standing coevolutionary relationships. However, little is known about the mechanisms of selection, either during development or during recovery from bleaching events. This talk will cover existing research to date and explore potential avenues for future experimentation. Research will be conducted at the University of Georgia and the Key Largo Marine Research Laboratory during the next eighteen months.

DOES VARIATION IN BEHAVIOR AND IMMUNE INVESTMENT LEAD TO PARASITE SUPERSPREADERS IN THE THREESPINE STICKLEBACK?

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In many infectious disease systems, key host individuals ('superspreaders') disproportionately infect others with parasites. Superspreaders could be individuals with behavioral traits that expose them to the greatest number of parasites, and with immune systems least capable of clearing infections. Testing these ideas requires exploring the physiological and life history trade-offs that underlie associations between host behavior, immune defense, and the outcome of infection. An amenable system for this question is the threespine stickleback fish, which has been well-studied in the fields of animal behavior and parasitism. In particular, sticklebacks have been found to have distinct personalities, or "behavioral syndromes", which occur when individuals behave consistently as 'bold' or 'shy' in response to mates, competitors, predators, and novel foods or environments. First principles suggest that a bold personality might correspond to increased exposure to diverse parasites, and compromised immune defense due to high energetic costs. Thus, I predict bold individuals might be candidates for superspreading. My dissertation research will explore this novel and integrative question using field and experimental approaches. First, I will study wild stickleback populations in Northern California to examine associations between personality, parasite exposure, and immune function. Second, I will use a series of captive experiments to test how fish lineages with different personality traits differ in their capacities to respond immunologically to controlled parasite infections. Collectively, my work will enhance current understanding of the behavioral patterns and mechanistic processes that lead to the variable parasite burdens that fascinate disease ecologists.

SENSITIVE INTERACTIONS: AN INVASIVE CASTRATING PARASITE AND ITS RESPONSE TO CLIMATE CHANGE IN GEORGIA'S ESTUARIES

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As the climate changes, the southeastern states are being subjected to increased drought. With these droughts come saltier estuaries, which can bring drastic changes in the intertidal communities. Several marine parasites have been shown to be less tolerant of low salinity than their hosts. As estuarine communities become more saline there could be an increase in parasite prevalence in their marine hosts. Parasites can have negative effects on reproduction, predation, and grazing; therefore an increase in parasite prevalence can have profound effects on the whole community. The goal of the proposed work is to explore the effect of an invasive castrating parasite (*Loxothylacus panopaei*) on mud crabs (*Eurypanopeus depressus*) in the oyster community and determine whether increased droughts could exacerbate the introduction. After completion of this project I will understand the relationship between 1) salinity and infection prevalence, 2) infection and effectiveness of the escape response and 3) host infection and predation rates. A model of the results from these separate experiments will help guide management of the estuary. This work will be conducted within the Sapelo Island National Estuarine Research Reserve (NERR) and I will proved the NERR with information on a system that could give early indication of the effects of climate change, specifically increased drought conditions.

ACTIVATED CHEMICAL DEFENSES SUPPRESS HERBIVORY ON FRESHWATER RED ALGAE

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The rapid life cycles of freshwater algae are hypothesized to suppress selection for chemical defenses against herbivores. Accordingly, chemical defenses have rarely been investigated in freshwater macrophytes and never before in freshwater red algae. We present the first evidence for anti-grazer chemical defenses in freshwater macroalgae. Structural, nutritional, and chemical traits of five species of red algae were assessed for their role in reducing algal susceptibility to crayfish grazers. *Boldia erythrosiphon* was palatable, while the cartilaginous structure of *Paralemanea annulata* reduced its susceptibility to grazing. *Batrachospermum helminthosum*, *Kumanoa sp.,* and *Tuomeya americana* showed evidence of activated chemical defenses; their extracts suppressed crayfish feeding by 30-60%. Activation is thought to reduce ecological costs of chemical defenses, and as such might be favored in freshwater red algae, whose short-lived gametophytes must grow and reproduce rapidly. The frequency of activated chemical defenses found here (3 of 5 species) is 3-20x higher than for surveys of marine algae or freshwater plants. If typical, this suggests that 1) herbivory is an important selective force in freshwater streams 2) freshwater algal chemical defenses may be missed if investigators do not consider chemical activation in their experimental design. Further investigation of defenses in freshwater algae can contribute to among-system comparisons and provide insights into the generality of plant-herbivore interactions and their evolution.

SHIFTING ECOSYSTEMS: EFFECTS OF MULTIPLE HUMAN-INDUCED STRESSORS ON ESTUARINE COMMUNITIES IN THE SOUTH ATLANTIC BIGHT, USA

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Ecosystem shifts have become increasingly common due to stress on systems by anthropogenic impacts. These shifts can result from a number of processes, including species introductions, land use modifications, and climate change. The introduction of ecosystem engineers, organisms that modify, create or maintain habitats, can have profound effects on the structure and function of their recipient systems. The recent invasion of an opportunistic red alga, *Gracilaria vermiculophylla*, provides an opportunity to investigate the effects of a prominent non-native ecosystem engineer in the estuaries of the South Atlantic Bight, mudflat habitats that were historically devoid of macroalgal primary production. More specifically, I propose to investigate the impacts of two human-induced stressors, invasive species and eutrophication, on the structure and function of estuaries in South Carolina and Georgia. Through my research I aim to: 1) To determine how *Gracilaria vermiculophylla* changes the physical structure, trophic structure, and nutrient cycling of the southeastern mudflats; 2) To assess *Gracilaria's* role in the conversion of essential fish habitat; 3) To determine the effects of eutrophication on these processes. As ecosystems continue to change in response to human-induced stressors, insights into the development of ecosystem shifts could aid in the development of effective management strategies.

THE ROLE OF ALGAE IN REGULATING DISSOLVED OXYGEN LEVELS IN BLACKWATER STREAMS DRAINING GEORGIA'S COASTAL PLAIN

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Slow-moving blackwater streams draining Georgia's coastal plain are important sinks for nutrients, sediments, and chemicals from agricultural runoff. Many of these streams also have extremely low dissolved oxygen levels in violation of state water quality standards in spring, summer, and fall. Recent research has explored physical and chemical dynamics affecting seasonal dissolved oxygen draw-down and dissolved organic carbon cycling in blackwater streams, but little is known about the role of algae in these processes. Blooms of periphyton consisting largely of filamentous diatoms have been observed in streams within the Little River Experimental Watershed (LREW) near Tifton, GA. For my master's thesis in ecology, I will (1) measure algal standing crop throughout the wet period in several LREW streams, and (2) examine the effects of algal growth, metabolism, and decomposition on daily and seasonal cycles of dissolved oxygen in these streams.

ENTERIC BACTERIA RELEASED BY BATHING TOURISTS IN THE DRY TORTUGAS NATIONAL PARK, FLORIDA

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Coastal monitoring for human sewage and fecal bacteria depend on the use of enteric bacteria indicators. However, current water sampling methodology does not accurately represent human bacteria and viruses within the environment and a multiple scale approach is needed. One method amendment could be sampling sponge tissue, because sponges filter feed and may concentrate ambient microbes including those introduced through sewage contamination. Multiple indicators for enteric bacteria and viruses were used into evaluate the levels of contamination within The Dry Tortugas National Park (DTNP) over multiple time points and degrees of recreational use. Combining the traditional sampling approach and collecting sponge tissue improved the power of sampling and resulted with confirming a low background introduction of enteric bacteria in DTNP. However, sequential sampling of water at the swimming beach showed that enteric bacteria significantly increased when people were present in the water. Though the levels of bacteria introduced are below EPA regulation standards, these results clearly implicate a strong role of recreational activities in the introduction of enteric bacteria in the marine environment. Additionally, sponge tissue did not culture any bacteria but with molecular tools there was evidence for low levels of enteric bacteria. Results suggest that screening sponge tissue as a substitute sampling method is not a dependable representative of human sewage contamination but can provided useful collaboration to results found with traditional sampling methods. Future research should continue to improve on sampling methods and targets for sewage contamination and understand the impact on ocean and human health.

ECOLOGICAL CONSEQUENCES OF THE EVOLUTIONARY PROCESS IN A NEOTROPICAL EPIPHYTIC ORCHID

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The spatial isolation of populations can lead to evolutionary divergence unless countered by the cohesive force of gene flow. Overtime, these processes can have remarkable effects on the ecology of species and their role in the broader ecosystem. Population genetic analysis reveals that *Epidendrum firmum* a Neotropical epiphytic orchid native to mid-elevation forests of Costa Rica's four mountain ranges, have diverged to form distinct and evolutionarily significant units on each mountain range. This evolutionary divergence appears to be associated with ecologically meaningful changes in the identity of symbiotic mycorrhizal fungi with which the orchid populations associate. Deforestation and habitat fragmentation threaten the survival of this orchid species and its native habitat and are causing a consequential reduction in the genetic diversity harbored by its populations. Fortunately, population genetic analyses are helping to identify conservation reasonable conservation priorities that may forestall the loss of genetic diversity.

DEMOGRAPHY IN DRIER STATES: SEASONAL FLUCTUATIONS OF TROPICAL MILKWEED POPULATIONS

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Seasonal patterns in weather play an important role in population dynamics and the evolution of life cycle schedules. Seasons in temperate zones have clear implications, with specific periods that favor reproduction and growth and harsh winters that cause death and reproductive dormancy. In the tropics, many plants grow and reproduce year-round despite distinct "wet" and "dry" seasons. Phenological patterns such as peak flowering times have been noted for many species, but the realized impact of these patterns on tropical populations remains unexplored. I am using a multi-season demographic study of natural populations of tropical milkweed (*Asclepias curassavica*) in Monteverde, Costa Rica to examine seasonal patterns in demographic parameters (growth, reproduction, and mortality). I will use population projection models constructed from census data in order to assess how the contributions of these parameters to population growth varies throughout the year and explore how future changes in climate may affect populations.

LOCAL ADAPTATION OF MARINE SNAIL HOSTS TO TREMATODE PARASITE ATTACK

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Hosts that are regularly attacked by parasites are expected to invest more in immunity (or at least invest differently in immunity) than hosts that are not attacked. This local adaptation, from the host's perspective, can be detected within a generation or sometimes trans-generationally. Host defense capabilities are expected to reflect the mosaic of parasite pressures across host populations. We examined the susceptibility of three species of marine periwinkle snails to infection by castrating trematode parasites in both lab and field manipulations. We hypothesized that snails collected from sites with historically high trematode prevalence would be better defended against infection. Further, we expected this increased defense to be intensified in the snail species whose reproductive strategies result in more closed populations. Our preliminary results show that *Littorina obtusata* and *L. saxatilis* from high prevalence sites were less likely than those from low prevalence sites to be infected by trematodes during the laboratory experiment, but field experiments did not show sufficient increases in infection to allow differentiation between sites. Because *L. littorea* did not frequently act as a host to the predominant trematode parasite of the other two snail species (which are mainly infected by *Microphallus similis*), we are unable to draw conclusions about the potential role of reproductive strategy in promoting or preventing local adaptation in this system.

SPATIAL AND DIET ANALYSIS OF FRESHWATER AQUATIC TURTLES IN COASTAL PLAIN OF GEORGIA

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The Southeastern United States is a global hot spot for freshwater turtles, with many species inhabiting isolated wetlands and streams in the Coastal Plain of Southwest Georgia. Previous studies have shown that there are significant movements in many species of freshwater turtles, but other species have been little studied in this context. I propose to investigate the overland and aquatic movements of freshwater turtles at the Joseph W. Jones Ecological Research Center in Southwest Georgia. The Jones Center is a 30,000 acres tract with multiple isolated wetlands and is bordered by the Ichawaynochaway Creek and the Flint River. I will be using mark-recapture, radio telemetry, and stable isotope analysis to investigate where *Trachemys scripta*, *Graptemys barbouri*, *Pseudemys concinna*, *Chelydra serpentina*, *Macroclemys temminckii* and other species are spending much of their lives. The long term goal of this project is to demonstrate the importance of lands between isolated wetlands and riparian zones for habitat conservation efforts.

THE EFFECT OF INVASIVE CHINESE PRIVET ON EARTHWORMS

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Southeastern floodplains have changed drastically since the introduction of the invasive plant, chinese privet (*Ligustrum sinense*). Privet forms monotypic stands, decreasing diversity and recreational value in these floodplains. Extensive removal of privet in areas of special interest could improve both of these conditions, although questions about the effects of removal remain. The National Forest Service set up large-scale privet removal sites in the Athens area in 2005 to examine how the removal of privet would affect the floodplain ecosystem. This study deals with the effects of privet removal on earthworms as well as some abiotic soil properties. Earthworm populations were sampled four times during a single year in control plots, two types of removal plots, and reference plots that have been minimally impacted by privet. Earthworm densities were found to differ between treatments, with privet-free reference plots having lower densities of earthworms, but higher densities of native species. Soil properties such as pH, N and C content, and N-mineralization were also evaluated. Privet plots had the highest pH levels while hand-felled treatment plots had the lowest. N-mineralization rates were highest in removal plots where privet was mulched, and privet sites had high rates of N-mineralization compared to reference plots. These results suggest that privet encroachment changes soil properties and biota and the effects can be mitigated by removal.

BELOWGROUND CARBON TRANSFORMATIONS IN RESPONSE TO SOIL WARMING

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Warming trends associated with climate change have the potential to increase the carbon (C) flux from the soil to the atmosphere. This relationship affects the storage capacity of the terrestrial biosphere and can potentially change it from a C sink to a C source. Previous climate warming studies have been conducted on nutrient-rich glacial soils and not on the highly-weathered Ultisol and Oxisol soils typical of 30% of the global land base including the southeastern U.S. Piedmont, subtropics and tropics. The objective of my doctoral research is to determine the mechanisms governing the response of soil organic matter (SOM) turnover and sequestration to sustained warming. A combination of chemolytic techniques,^{13}C-NMR, and soil respiration indicate that highly-weathered soils show a dynamic response to warming. Thus far, an increase in soil respiration and carboxyl C compounds with warming suggest enhanced microbial activity and oxidation of labile plant carbohydrates (O-alkyl C). Conversely, alkyl C (recalcitrant plant C) that typically increases as a result of decomposition, decreased in the organic layer under heated conditions, perhaps indicating stabilization of these compounds onto iron and aluminum oxide mineral surfaces abundant in the southeastern U.S. The relationship between soil structure and stabilization of SOM is an important element of soil C dynamics and may show considerable changes with warming in highly-weathered soils.

THE EFFECTS OF AIR-EXPOSURE STRESS GRADIENTS ON THE SPATIAL PATTERNS OF DISEASE IN THE EASTERN OYSTER, *CRASSOSTREA VIRGINICA*

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Spatial distributions of species can be shaped by factors such as mortality, growth, and disease - all of which can be influenced by physiological and environmental stress. In habitats such as the intertidal zone, various durations of air-exposure that occur during low tide create defined stress gradients that shape the spatial distributions of benthic marine organisms. The eastern oyster, *Crassostrea virginica*, an economically and ecologically important species in Chesapeake Bay, lives in both the intertidal and subtidal in Virginia, but only in the subtidal in Maryland. Field experiments and sampling from Maine to North Carolina were used to determine whether disease (Dermo), mortality, and growth of oysters vary along an intertidal-subtidal stress gradient during summer in Chesapeake Bay. Results indicated that Dermo prevalence and mortality decreased and growth increased from the peak to the bottom of the intertidal gradient. Dermo prevalence was higher in habitats with longer durations of air-exposure but disease progression did not differ consistently along the intertidal gradient. Patterns in summer disease, mortality, and growth along a tidal stress gradient do not, on their own, entirely explain the disjunct spatial distribution of oysters in the intertidal and subtidal of Chesapeake Bay, but are important contributing factors. Overall, these results indicate that disease can play an important role in shaping the spatial distributions of ecologically important species.

MODELING CURRENT AND FUTURE POTENTIAL RANGES OF INVASIVE SPECIES

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Climate change and invasive species are two major drivers of global ecological change. The Asian clam, *Corbicula fluminea*, is one of the most widespread invasive species in the United States and can reach extremely high densities. Using Maximum Entropy modeling and climatic variables from BioClim, I examine if under current climate conditions there are regions of the country that are suitable for *Corbicula* populations, but are currently uninvaded. Also, using projected IPCC 4 climate projections of future climate conditions, I will examine how climate changes will affect *Corbicula*'s predicted range in the United States. Based on IPCC 4 climate projections, *Corbicula* could expand to the north, leading to potential new invasions in New England, and potential for major ecosystem changes in northern rivers post-invasion.

IDENTIFYING THRESHOLDS IN ECOLOGICAL RESPONSE TO RIVER DISCHARGE USING EFFECTIVENESS ANALYSIS

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As demand on freshwater increases, water managers must trade-off potentially conflicting uses of this resource such as municipal water supply, recreation, hydropower, and maintenance of aquatic ecosystem integrity. Although the importance of "environmental flows" is widely acknowledged, challenges arise in specifically identifying what flow regime is needed to obtain a desired ecological state. Moreover, aquatic species are adapted to a complex flow regime composed of the magnitude, frequency, duration, timing, and rate of change of river discharge. The objective of this study is to develop a framework for determining ecologically significant thresholds in the magnitude and frequency of volumetric river discharge. To do so, we will apply a common technique in fluvial geomorphology and sediment transport, effectiveness analysis. This analytical methodology combines the magnitude and frequency of sediment transport events to estimate the range of discharges that transport the most sediment over long time scales. We will use the well-studied Middle Oconee River near Athens, Georgia to test this approach. An off-channel, pump-storage reservoir withdraws water from the river and will provide the opportunity to examine natural, modified, and environmental flow regimes. Effectiveness analysis will be conducted for a variety of ecological processes ranging from aquatic plant habitat provision to leaf decomposition to fish reproduction to assess whether multiple ecological processes align to similar thresholds in discharge. This presentation introduces effectiveness analysis, highlights key elements of the Middle Oconee case study, and assesses the influence of model uncertainty on detection of ecological thresholds.

EXTENSION OF OXIC PERIODS BY BRYOPHYTES ON BUTTRESSED TRUNKS AND KNEES OF BALDCYPRESS

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We use laboratory and field studies to determine whether forest composition influences aquatic bryophyte primary productivity and oxygen release in blackwater swamp forests. To model total bryophyte oxygen release, we measured *Porella pinnata* biomass within tree trunk and knee surface area supporting bryophyte growth, relative to water depths simulated with self-leveling lasers. Photosynthesis-irradiance curves indicate that bryophyte oxygen release exceeds uptake at irradiance above 25 $\mu mol \cdot m^{-2} \cdot s^{-1}$, which is lower than levels (35-272 $\mu mol \cdot m^{-2} \cdot s^{-1}$) measured within bryophyte growth zones. Highest riverine dissolved oxygen (DO) was observed when water depth submerged bryophytes but maximized light exposure. At low discharge, water drops below bryophyte growth zones, lowering DO concentrations. At moderate discharge and temperature, bryophytes exert strong influence on ecosystem metabolism, but microbial respiration exceeds photosynthetic oxygen release at high temperatures. Riverine DO was modeled under three scenarios: 1) current forest composition, with cypress knee surface area included, 2) with knee surface area removed, and 3) forests composed entirely of *Nyssa*. Results suggest that forest composition influences aquatic bryophyte primary production: buttressed trunks and abundant knees in cypress-dominated swamps produce greater surface area for bryophyte growth, which delays seasonal onset of anoxia. This study demonstrates the importance of aquatic primary production in forested blackwater rivers and shows how cypress, an intensively-harvested foundation tree species, can significantly modify ecosystem function.

LONG TERM LAND USE MANAGEMENT PLAN FOR THE WHARTON CONSERVATION CENTER

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The Wharton Conservation Center is a 129-acre tract of land in Towns County, Georgia and Clay County, North Carolina. As refuge for many boreal species during the glacial Pleistocene, this area is now a biodiversity hotspot. Bought in 1958 by renowned naturalist and conservationist Charlie Wharton, the Wharton Conservation Center is now owned by the Georgia Wildlife Federation and is protected by a conservation easement held by the Nature Conservancy. Prior to his passing, Dr. Wharton expressed his strong desire to use the property as an interpretive site while maintaining the integrity of the land. I will draft a long term land use management plan for the WCC. The plan will determine practical uses for the center such as providing research and educational opportunities and will also determine how to implement them while still preserving the integrity of the land. I will identify possible funding sources for projects. The plan will focus on protecting, restoring, and researching native species like the brook trout and eastern hemlock. It will investigate how to restore and maintain natural habitat. It will be a guide not only for the Wharton Conservation Center but for all of Southern Appalachia. The WCC will lead conservation in the area and expand its positive impact to the whole southern region.

SOCIAL NETWORK ANALYSIS WITH INSIGHTS FOR DISEASE TRANSMISSION DYNAMICS IN WILD CHIMPANZEES

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In recent decades, infectious diseases have threatened the health of Africa's endangered apes. While social structure can influence disease transmission dynamics, few studies have quantified wildlife contact networks to inform disease management strategies. Our work uses field-collected behavioral data to quantify contact rates and to provide a social network structure necessary for modeling disease transmission. Over a 10-month study period, we recorded the frequency of social interactions for a community of wild chimpanzees (N=50) in Kibale Forest, Uganda. Using mixed effect models and social network analysis, we examined contact variability among community members and evaluated the importance of individual and environmental variables. We also used node-level regression to assess how social factors affect the position (e.g., centrality) of individuals in the network. Results show a high degree of variation in contact rates across months and among individuals. Predictors including relatedness and the number of estrus females in the community significantly affect the likelihood that two individuals will interact, while rank and family size significantly affect an individual's centrality in the network. This work represents a multi-disciplinary approach to understanding how behavior affects pathogen transmission. Our findings provide information needed to develop intervention strategies for protecting Africa's great apes in the event of an epidemic.

EFFECTS OF ALTERED HOST MIGRATION ON PARASITE EVOLUTION

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Mounting evidence suggests ecological changes can drive the emergence and spread of infectious diseases. For example, anthropogenic environmental changes have been linked with altered pathogen transmission (e.g., agricultural intensification tied to Nipah virus epidemics). Although increasingly studied from an ecological perspective, effects of human activities on pathogens remain largely unexplored from an evolutionary perspective. This will be an important research area as disease burdens for humans and wildlife continue to increase. In particular, human-induced changes in migration patterns of some host species can increase disease risks by altering host-parasite dynamics, but this has rarely been studied. In this presentation, I will propose research to examine how human activities that alter the migration of monarch butterflies will affect the prevalence and evolution of their protozoan parasite *Ophryocystis elektroscirrha* (OE). I predict OE infection will be more prevalent and virulent in monarchs with reduced migratory behavior (overwintering in the southern U.S.) compared to monarchs that underwent the traditional 2500-km migration (overwintering in central Mexico). To test these hypotheses, I will (1) collect samples from migratory monarchs in Mexico and winter-breeding monarchs in the southern U.S. to compare parasite prevalence and intensity, (2) conduct infection experiments with OE isolates from U.S. and Mexico sites to compare measures of virulence, and (3) perform additional experimental infections and determine the frequency of mixed-strain infections, which may promote virulence evolution, in monarchs from U.S. and Mexico sites. The proposed research may help to uncover critical but unexplored effects of loss of migratory behavior on parasite evolution.

AMPHIBIAN COMMUNITY COMPOSITION AND HEALTH IN RICE FIELDS IN COSTA RICA

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Humans modify their environment in many ways, but one of the most important for amphibians is destruction of wetlands and conversion to human land uses. While rice fields have been proposed as an adequate alternative habitat for displaced amphibians, this idea has never been rigorously tested in the field. We are working to establish an experimental research site to study regional climate change and land use in the Rio Tempisque Basin, Costa Rica. Within this context, I am conducting a call census of amphibian assemblages and an in-depth study of *Bufo marinus* population health within contrasting land use types characterized by various pesticide regimes: conventional rice farms and organic rice farms. Captured *Bufo marinus* are sampled using a variety of techniques to analyze body condition, stress levels, immune response, and pathogen and parasite abundance. Using a variety of body condition measures, *Bufo marinus* are shown to have differential condition scores in conventional and organic rice fields. Interestingly, females are generally more heavily affected than males. This suggests that pesticide usage is having a negative effect on the condition of amphibians living in rice fields, which may translate into a loss of fitness.

EVOLUTIONARY AND ECOLOGICAL EFFECTS OF TRINIDADIAN GUPPIES ON ECOSYSTEM STRUCTURE IN NATURE: A NATURAL EXPERIMENT

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Ecological processes have long been known to affect evolution, yet only recently has there been experimental evidence for evolutionary change to affect ecology. This interaction provides evidence for a feedback loop between ecology and evolution, termed eco-evo dynamics. To test the generality of evolution-to-ecology pathways in nature, we conducted a "natural experiment" on the effects of locally adapted Trinidadian guppies (*Poecilia reticulata*) on ecosystem structure in headwater streams. In Trinidad, guppies that evolved with many predators have distinct life history traits and diet from those adapted to low predation environments. In this study we surveyed headwater streams containing two species of fish the killifish, *Rivulus hartii*, and guppies either introduced high predation phenotype (3yrs post introduction) or naturally occurring low predation phenotype. In each stream waterfalls truncate guppy presence, allowing us survey guppy-free reaches and estimate guppy effects on ecosystem structure in each stream. In our survey we measured: (a) the diversity and biomass of algae and invertebrates, (b) benthic organic matter standing stocks, and (c) gut-content and life-histories of guppies and killifish. Preliminary results show significant effects of not only guppy presence but also guppy evolution on organic matter standing stocks, however no significant treatment effects on algal biomass. These preliminary results show that evolutionary processes can be important in shaping certain ecosystem properties in nature, giving evidence for eco-evo dynamics in this model system.

SOUTHERN APPALACHIAN STREAM VISUAL ASSESSMENT PROTOCOL PROTOCOL (saSVAP): THE CUSTOMIZATION OF A STREAM VISUAL ASSESSMENT PROTOCOL FOR THE SOUTHERN APPALACHIAN REGION

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The original Stream Visual Assessment Protocol (SVAP) was designed in a joint effort between the United States Department of Agriculture's Natural Resource Conservation Service and the University of Georgia's Odum School of Ecology and Geography departments, as a nation-wide, user-friendly, qualitative stream assessment tool. The goals of the saSVAP project are to: (1) customize SVAP for the unique Blue Ridge eco-region of the Southern Appalachian Mountains of Georgia and North Carolina; and (2) provide a citizen- science tool for stream assessment, environmental education and outreach. Two versions of the saSVAP are currently being developed: The *saSVAP document*; designed for both citizens and those with field experience in streams, and the *saSVAP app*; an interactive digital application designed in collaboration with University of Georgia's Computer Science Department as a citizen-science tool for riparian land owners, students, and concerned citizens. The ongoing development of the saSVAP includes collaboration between NSF's Coweeta LTER, UGA's Odum School of Ecology and UGA's Anthropology Department; the goal being to design tools that can relate human behavior and perception to the ecologically relevant characteristics of stream integrity as measured by a visual assessment.

INCIDENCE OF WEST NILE VIRUS IN MOSQUITOES AND TURTLES IN REFERENCE AND AGRICULTURAL WETLANDS IN SOUTHWESTERN GEORGIA

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Emerging infectious diseases are becoming a hallmark of the 21st Century, which has seen the rise of diseases such as cholera, H1N1, and West Nile Virus (WNV). WNV was completely unknown in the United States until 1999 when it surfaced in New York. Birds and *Culex* mosquitoes are the main hosts of this virus, spreading it across the country. Research has shown that other organisms such as horses and alligators as well as humans are able to contract and die from this virus. It is not known whether turtle species can serve as competent hosts for WNV. This study will examine the occurrence of the West Nile Virus in mosquitos and turtles in southwestern Georgia in four reference and four agricultural wetlands to determine 1) if there is a difference in the incidence of WNV in reference and agricultural wetlands; 2) do turtles serve as WNV hosts; and 3) is the incidence of WNV in mosquitoes and turtles similar.

DAMMING EFFECTS ON NUTRIENT DYNAMICS IN TROPICAL HEADWATER STREAMS

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Damming streams to create sources of potable water supplies is a practice that has been increasing very rapidly in small tropical islands. Previous studies have shown that large dams in Puerto Rican rivers can create a drastic change in the ecosystem by blocking migration pathways and thereby completely extirpating amphidromous native macroconsumers from upstream reaches. The major ecosystem-level consequences of this issue are (a) complete change in faunal community structure, (b) increased levels of basal resources and nutrients, and (c) decreased rates of organic matter processing. We studied the effect of these faunal extirpations on Nitrogen (N) and Phosphorus (P) dynamics in 6 different stream reaches (3 dammed and 3 undammed) around the whole island by conducting short-term additions of N and P in each reach during the Summer of 2010. We also estimated the direct contribution of macroconsumers to the stream nutrient pool and how this potentially affects the nutrient uptake at the reach scale. Streams above large dams showed a slightly longer uptake length (S_w) for N but not for P. Native macroconsumers in undammed streams seems to affect nutrient dynamics mostly indirectly by controlling basal resources through feeding and bioturbation. We suggest that general uptake length for both N and P should be shorter in reaches above dams during the dry season compared to the patterns of the rainy season presented here due a higher accumulation of periphyton in streams above large dams.

CHARACTERIZING IMMUNE GENE DIVERSITY IN MONTANE VOLES (*MICROTUS MONTANUS*) AND TESTING FOR EVIDENCE OF BALANCING SELECTION

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The major histocompatibility complex (MHC), an ancient chromosomal region found in virtually all vertebrates, possesses some of the greatest genetic diversity ever recorded. Surprisingly high levels of diversity at MHC loci have been reported in wild vertebrate populations, most frequently attributed to balancing selection (parasite-mediated and/or mate choice). While MHC genetic variation has been retained despite bottlenecks and population fragmentation in some species, drastic reductions have occurred in other threatened species with direct implications for increased susceptibility to infectious diseases. From a conservation perspective, it is important to understand how selection on immune genes may change with population abundance, as wildlife populations fluctuate over time and many are experiencing declines. Our study focused on the North American montane vole (*Microtus montanus*) in the East River Valley, Colorado, which undergoes regular population cycles approximately every three years. In this study we characterized the variability of the functionally important exon 2 of the MHC class II DRB gene, and investigated evidence for balancing selection. Using Next Generation (454) sequencing, we found evidence for a duplicated DRB locus, and 27 alleles among 142 individuals from three populations. We did not find evidence of recombination among alleles using three different methods. We also did not find evidence of balancing selection based on rates of substitution; however, phylogenetic trees constructed from DRB alleles across 11 rodent species indicate maintenance of alleles across speciation events. Comparing montane vole DRB diversity across rodent species suggests that evidence of historic balancing selection may be less apparent in cyclic rodent species.

TWO NEW SPECIES OF CHYDORUS (CRUSTACEA: CLADOCERA) FROM THE SAVANNAH RIVER SITE, SOUTH CAROLINA

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The genus *Chydorus* consists of at least 30 species found worldwide in a variety of freshwater habitats. With few exceptions, they are quite morphologically conserved, which has led to many distinct species going unrecognized. Investigations beginning in the late 20th century discovered that North America was home to many endemic *Chydorus* that had previously been identified as one of several holarctic or pan-tropical species. In zooplankton surveys at the Savannah River Site, South Carolina, we collected two *Chydorus* forms that did not match with known species descriptions. Morphological comparisons revealed that both forms have several distinct and consistent characters that distinguish them from their congeners. In addition, preliminary genetic analysis supports their distinction from each other and from several related species. Both morphological and genetic analyses indicate that one of the new species is closely related to other *Chydorus* species; however, the phylogenetic affinities of the second species remain unclear and require further analysis.

Poster Presentations

CHANGES IN SOIL CARBON CYCLING ACCOMPANYING CONVERSION OF A ROW-CROP TO GRAZING DAIRY

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Increasingly, the dairy industry in the southeastern US is transitioning from total confinement dairy systems (TCD) toward pasture-based, management intensive grazing dairy (MiGD) systems. The MiGD system involves 12-hour rotational grazing to target plants at optimal digestibility (~20-days) and limit the need for grain. MiGD cows spend >90% of their time in the field and consequently deposit > 90% of their waste directly to the soil surface. To assess the impact of this emerging land-use change on the carbon (C) cycle, we sampled a chronosequence of row-crop to MiGD conversion in southeastern Georgia, capturing fields at 2, 3, and 5 years since conversion. We found total soil C and C associated with the clay fraction increased following conversion, with the greatest increases occurring between 3 and 5 years since conversion. Clay-associated C is typically highly stable and thus increases in this fraction suggest MiGD systems facilitate C stabilization and accumulation. Natural abundance $\delta^{13}C$ data and percent root mass suggests that forage roots are likely a major C contributor. Our future work will distinguish between forage and manure contributions, characterize the chemical composition of clay-associated C, and determine the relative stability of C sequestered.

BEHAVIORAL RESPONSE OF WHALE SHARKS (*RHINCODON TYPUS*) TO ODOR PLUMES: IMPLICATIONS FOR FORAGING ECOLOGY

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The whale shark *Rhincodon typus* is a remarkable species due to its size and foraging strategy. However, what is known of the biology of *R. typus* fails to address their tendency to aggregate at regions with high prey density. This study investigated odor perception by the species as a possible factor influencing effective navigation by exposing the shark's to chemical plumes in the water. We introduced two control treatments and one treatment supplemented with krill odor. Defined feeding behaviors were infrequently seen in pre-krill (15.9%, n=69) or post-krill (25.9%, n=58) control treatments, while a response was seen in the majority (74.1%, n=53) of krill exposure treatments. There was a significant decrease in net to gross displacement ratio between krill treatments and controls (p=0.0496, p=0.0347 Student's t-test). There was also a significant increase in the frequency of visits to the plume-introduction site during krill treatment intervals (p=0.0007, p=0.0129). The high frequency of responses associated with feeding behavior seems to indicate that *R. typus* associates certain odors with their prey, and an increased frequency of recruitment to the plume introduction-site suggests odor may be a contributing factor to their effective navigation to prey aggregations. Further data analysis and experiments utilizing varying odor stimuli are forthcoming.

COMPARATIVE METHODS OF INVESTIGATING SMALL-MAMMAL POPULATION DYNAMICS

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Investigation into the dynamics of small-mammal populations requires an effective method to estimate population abundance. Various mark-recapture devices have been traditionally contrived to capture small mammals, such as the HB Sherman live trap, nest box, and nest tube. This study investigated the effectiveness of each of these methods for estimating the abundance of the white-footed mouse, *Peromyscus leucopus*, commonly inhabiting the North Georgia Piedmont. Five transects were established within deciduous-forest habitat, each containing twelve stations (four stations per method). All capture devices were mounted 1.5 m aboveground on mature water oaks, *Quercus nigra,* of similar DBH with an average of 47.9 cm. Capture of *P. leucopus* was conducted from 28 September 2010 through 1 October 2011. A total of 94 different animals were captured and marked. Of 685 total captures and recaptures, 82.2% were captured in live traps, 7.6% nest boxes, and 10.2% nest tubes. There was a seasonal trend in capture; nest boxes and nest tubes were occupied frequently during autumn and winter months (i.e. during the months of reproduction), whereas the HB Sherman live traps were occupied consistently throughout the year.

TESTING BACTERIA-KILLING ABILITY IN HEALTHY AND MYCOPLASMAL CONJUNCTIVITIS INFECTED HOUSE FINCHES (*Carpodacus mexicanus)* BEFORE AND AFTER ACUTESTRESS

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Stress inhibits immune function, but how is not completely understood. The leukocyte response to stress is the key. A paradox of the immune response to stress is that while the number of heterophils, a phagocytic leukocyte, increases, the ability of the blood the kill bacteria decreases. In this study, the effect of stress from capturing and holding wild house finches, *Carpodacus mexicanus*, for two hours is tested by measuring leukocyte counts and running an assay in which plasma is exposed to bacteria to measure the innate killing ability. The ratio between the number of heterophils and lymphocytes gives a measure of how capable the blood is at fighting off bacteria under stress, and this ratio can be compared in pre-stress and post-stress samples from the same bird. House finches infected with *Mycoplamsa gallisepticum* and ones with no obvious infection were captured for this study. This bacterial infection is common among finches and can be spotted by the development of red, runny eyes. Sampling infected birds allows for analysis of how capture stress combined with a pre-existing infection affects the leukocyte counts and bacteria-fighting ability. The results of this study are still being compiled. This study will add to the current understanding of how stress affects an animal's immune function and, therefore, risk of infection.

ANALYZING GENETIC DIVERSITY AMONG INDIVIDUALS OF TWO RARE ORCHID SPECIES OF NORTH AMERICA

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Cypripedium is a genus of lady's slipper orchids native to the temperate and polar zones of the Northern Hemisphere. Wild *Cypripedium spp.* have become increasingly rare due to habitat loss and overcollection. We studied sympatric populations of *C. parviflorum* and *C. candidum* collected in 2009 from the Grant Woods Forest Preserve, Lake County, IL, to determine whether these rare plants have depauperate levels of genetic diversity. Three microsatellites were developed and used in conjunction with spatial analyses to determine genetic diversity among individuals of each species and between the two species as a whole. *C. parviflorum* averaged 2.33 alleles per microsatellite, and *C. candidum* averaged 3.33 alleles per microsatellite. As habitat loss continues to fragment and isolate populations of orchids, genetic variation may decrease and leave populations vulnerable to further reductions in size or even extinction.

ARABIAN NIGHTS: A SURVEY OF HERPETOFAUNA FROM OMAN AND THE UAE

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Amphibians and reptiles of the Arabian Peninsula are composed of groups of both African and Asian origin and past phylogeographic studies have revealed radically different histories for each group. We spent six weeks in June and July of 2011 collecting in sand dunes, salt flats, wadis, and mountains of Oman and the United Arab Emirates, collecting greater than 300 specimens of more than 30 species of amphibians and reptiles. In the summer of 2012, we will further study the phylogeographic relationships of some of these groups, especially the Dhofar Toad (*Bufo dhufarensis*). Here, we present the results of our survey and hypotheses for future studies.

PREDICTORS OF TICK BURDEN AND ENGORGEMENT IN GRANT'S GAZELLE

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Despite the negative effects of tick infection and the widespread distribution of ticks in African ungulates, very little is known about the factors that affect patterns of tick infestations in this group of hosts. Our study examined possible predictors of tick burden and engorgement rates in the Grant's gazelle (*Nanger granti*). We captured 61 gazelle at the Mpala Research Centre, Kenya in June 2011; and sex, age, body weight, body size (body length and neck circumference), overall tick burden, and number of engorged ticks were assessed for all individuals. We found that females and younger animals had a higher average tick burden than males and older individuals. Body weight was negatively associated with tick burden, while body size was positively associated with tick burden. Body weight and body size were also significantly correlated with the proportion of engorged ticks, whereas sex and age had no significant effect. Our results support previous studies examining tick infestations in small mammals, which show that tick burden typically increases with body size. On the other hand, the negative correlation between body weight and tick burden may reflect the effect of body condition rather than size. Our results also suggest that body size and weight may affect tick engorgement. Overall, our study contributes to a better understanding of the relationship between intrinsic host factors and tick parasitism.

SOIL RESPIRATION RESPONSE TO N, P, AND CARBON AMENDMENTS

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Developing a mechanistic understanding how soil respiration is affected by carbon and nutrient limitations is pivotal in this fast and changing world. The importance of mycorrizhal fungi for soil decomposition is undisputed. However, relationships between mycorrizhae production and soil respiration are not clearly understood. Dextrose, mannitol and trehalose are carbon compounds produced by an array of organisms, but fungi, and specifically ectomycorrhizal fungi, produce the latter two in large quantities for storage. Microbial adaptation to utilize these sugars could indicate the presence of a plant-mycorrizhal-bacterial coupled pathway of carbon decomposition. In order to explore the nutrient and carbon limitations on soil respiration, soil cores were collected at the Coweeta LTER from sites along a representative elevation gradient and subsequently separated by depth (organic, 0-10, 10-20 cm). Soil samples were amended with one of six treatments: Control, NO3 (15µg/g), KH2PO4 (5 µg/g), or carbon amendment (40 mg/g; mannitol, trehalose, or dextrose). The CO2 flux was determined by measuring the CO2 concentration in the headspace at 1 hour, 3 hours, and 24 hours after amendment. CO2 fluxes were significantly higher from samples amended with the trehalose and/or dextrose than soils amended with N and P, though no difference was apparent between these two sets. This study shows carbon to be the main limitation for microbial activity with a strong preference for trehalose and dextrose.

THE EFFECT OF PREDATION THREAT ON IMMUNE FUNCTION IN CRASSOSTREA VIRGINICA

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The immune system of many animals can be affected by stressors in their habitats. Bacteria retained in *Crassostrea virginica* is of interest because of their role as a raw food source for human consumption. An effective immune system will not retain as much bacteria as one that is compromised. One way an oyster's immune function can be measured by the efficiency of its hemocytes. We will investigate how known predators of oysters affect hemocyte activity. Techniques that will be used to measure immune function include a bacterial killing assay followed by a direct bacterial count, quantifying Phenoloxidase *in vitro*, and relative phagocytosis quantified by flow cytometry. By measuring the effectiveness of the immune system under predatory stress, this research could inform the scientific community how this stress affects disease dynamics at the mechanistic level. If infection resistance differs between oysters under predation and those not under predation, then we hope to carry out similar experiments in a natural environment versus the laboratory setting.

INVERTEBRATES IGNORING A PREDATORY CHEMICAL CUE IN A PUERTO RICAN NEOTROPICAL STREAM

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Benthic invertebrates use drift as a means for dispersal as part of the their life cycles, to find suitable habitat, or to avoid predation. Visual predators (e.g., fish) can be size specific when targeting prey and thus be most successful during times of high visibility (i.e., increased daylight, low turbidity). Consequently, many invertebrate prey display peaks in drifting behavior during times of low predator activity (i.e., nighttime, high discharge events). Invertebrate drift rates can also vary with life (e.g., developmental) stage. Several studies have shown increased drift rates in mayfly nymphs in response to a fish odor chemical cue in streams containing predatory fishes. Here we examine differences in invertebrate drift rates and assemblage structure in response to a chemical cue (i.e. fish odor) simulating the presence of predatory fish in a stream containing no predatory fish. To do so, we injected 30 gallons of both fish-scented water and regular stream water in a stream and collected drift samples in nets approximately five meters downstream of the injection site. We hypothesized that invertebrate drift rates would increase as a response to the predatory cue. We also expected differences in drift rates to be more pronounced during nighttime after the treatment (i.e., release of fish odor) because of previous studies expressing this as a common method to avoid visual predators. Our results showed no difference in drift densities between samples exposed to fish odor and normal stream water, collected at different times of day, and at different intervals(before, during and after injection). These findings suggest that a response to the predator chemical cue is an evolutionary response to avoid predation in streams already containing fish. It is unlikely that the aquatic insects in the head water streams, above many barriers to predatory fish migration, could have been exposed to this higher daytime predation. This has major implications for the management of streams as it is clear that large dams and disruptions can alter the behavior of many organisms, not only downstream, but upstream as well.

MONITORING RARE SPECIES: DEVELOPING METHODS TO LOCATE AND SURVEY FOR THE ENDANGERED BOG TURTLE

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North America's smallest turtle, the bog turtle (*Glyptemys muhlenbergii*), resides in the bogs of the eastern United States. Habitat loss and deterioration, as well as illegal collection for the pet trade, have resulted in this turtle being listed as Critically Endangered under the IUCN Red List. Cryptic and rare, it is extremely difficult to assess their population status. In addition, monitoring efforts are often done in a manner that cannot be used to estimate species detection rates, population abundance, or population viability. Time-effective methods of surveying for new populations are also largely lacking. To address these deficiencies several mentors and I are (1) developing a species distribution model (SDM) for the bog turtle to better predict where populations should occur, (2) determining the best methodology and minimal effort required to determine with confidence whether bog turtles are present at a site, and (3) testing the SDM and trapping methodology in South Carolina where bog turtles have not been seen in over a decade. Current analyses are based on what we have learned from a basic SDM and a season of mark/recapture data collected in Georgia using the new methodology. We hope this project will help state wildlife agencies in their efforts to conserve bog turtles. More generally, it is a case study that will contribute to designing robust monitoring of rare and cryptic species.

MANIPULATING TROPICAL FIRE ANT POPULATIONS TO DECREASE THE COFFEE BERRY BORER

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The coffee berry borer, *Hypothenemus hampei,* is the greatest pest in coffee production worldwide. Ants are the primary known predators of the coffee berry borer and some research has been conducted into which ant species are the most efficient predators. The tropical fire ant, *Solenopsis geminata,* is common throughout Central American coffee farms, but *S. geminata* is not known to be a strong predator of the coffee berry borer. We conducted an experiment in two shade farms in Costa Rica to test the hypothesis that *S. geminata* indirectly protects the coffee berry borer by suppressing conspecific ant populations. Here we show that removal of *S. geminata* from a coffee plot can lead to a significant increase in the disappearance rate of coffee berry borer beetles from coffee berries over a 72 hour period compared to control plots.

ENZOOTIC STABILITY AS A POTENTIAL SOURCE OF REPORTING ERROR FOR HEMORRHAGIC DISEASE IN *ODOCOILEUS VIRGINIANUS* FROM TEXAS AND OKLAHOMA

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Hemorrhagic Disease (HD) is the most important wildlife disease afflicting White-tailed Deer (*Odocoileus virginianus*) in North America. Two *Orbiviruses* cause HD, including several serotypes of Bluetongue Virus (BTV) and Epizootic Hemorrhagic Disease Virus (EHDV). Transmitted by the *Culicoides* vector, HD's spatial and temporal spread displays no apparent pattern but sporadically causes morbidity and mortality across the United States. Despite prime vector habitat and an abundant host population, Texas and Oklahoma largely have no reported cases of HD during a 28-year survey period (1980-2007). The phenomenon of *enzootic stability* has been proposed as an explanation, which we explored using computer modeling. Under enzootic stability conditions, a disease maintains an endemic, asymptomatic nature through high transmission and early-onset host resistance. Similar trends have been observed in other wildlife diseases, such as Africa's East Coast Fever (*Theileria parva*) and Brazilian *Babesia*, causing significant animal management problems. Using SIR models, we analyzed computer simulations incorporating an *asymptomatic but infectious* (A) class, hypothesizing that such a class could explain the transmission of viruses without apparent disease. The results showed that an A class, over time, can suppress clinically diagnosable disease in a population while perpetuating the infectious agent.