Graduate Student Symposium

February 5 – 6, 2021

Welcome and Acknowledgements

Welcome to the 27th annual Graduate Student Symposium (GSS) at the Odum School of Ecology! GSS is organized by graduate students and serves as a forum to showcase student research at all stages of development. The goals of GSS are to provide opportunities for graduate students to give professional presentations and stimulate communication and camaraderie between students and faculty throughout the Odum School of Ecology and the broader UGA community. This year more than ever GSS serves as a crucial event for graduate students to reconnect with one another or make new friendships across cohorts.

This year's symposium could not have happened without the time and effort of numerous graduate student volunteers. We thank all of you for helping us plan our first virtual GSS!

Program Committee: A. Briggs, K. Connelly, A. Schatz, C. Teitelbaum
Undergraduate Poster Committee: K. Christie, I. Ragonese, A. Willoughby, K. Zemaitis
Feedback Committee: D. Gokhale, M. Müller , L. Naslund, K. Petersen, D. Suh
Souvenir Committee: M. Kelly, M. Monroe, C. Prouty, A. Quan
Prospective Student Committee: C. Cummins, D. Dunn, C. Wilson
A/V: K. Arnold, D. Chaussadas, M. Tomamichel, D. Vasquez
John Spencer 5K: T. Odom, K. Solomon

Many undergraduate and graduate students also volunteered to present posters and give presentations. Furthermore, faculty, post-docs, and graduate students all contributed to provide feedback on presentations. Constructive, friendly feedback obtained from these judges is one of the most beneficial elements of GSS. Thank you all!

The staff of the Odum School of Ecology provides administrative and technical support throughout the event and have been especially important for this year's virtual symposium. In particular we want to thank Julie Gunby, Beth Gavrilles, Tyler Ingram, Brian Perkins, Mica Turner, Joanne Greenway, Benjamin Taylor, and Allison Walters for their assistance and work to keep Odum running! Additionally, we would like to thank the generous support from the Eugene and Will Odum Ecology Fund.

Finally, we thank you for taking time to attend the event. We hope this GSS will help kick off a hopeful 2021 and give you the space to see old friends, make new ones, and foster a welcoming community here at the Odum School. Please enjoy the talks, provide constructive feedback to the student participants, and consider contributing next year!

Sincerely,
Jeffrey Beauvais and Nate Tomczyk
2021 Graduate Student Symposium Coordinators

History of the Graduate Student Symposium

Year	GSS Organizer(s)	Keynote Speaker	Affiliation at the time
1995	Janice Sand, Liz Kramer, Bob Hall, Anne Dix	NA	NA
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 Hernandez	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
2012	Kimberly Kellett, Kyle McKay	Matt Whiles	Southern Illinois University – Carbondale
2013	Courtney Collins, Ethan Epps	Wyatt Cross	Montana State University
2014	Carly Phillips, Sam Woolford	Bob Hall	University of Wyoming
2015	Katie Brownson, Elise Krueger	Mike Strickland	Virginia Tech
2016	Jessica Chappell, Rachel Smith	Doug Parsons	Society for Conservation Biology
2017	Caitlin Conn, Kelsey Solomon	Elizabeth Sudduth	Georgia Gwinnett College
2018	Daniel Harris, Talia Levine	Dave Walters	U.S. Geological Survey
2019	Michelle Evans, Claire Teitelbaum	Virginia Schutte	Louisiana Universities Marine Consortium (LUMCON)
2020	Kaylee Arnold, David Vasquez Jr.	Rebeca de Jesús Crespo	Louisiana State University
2021	Jeffrey Beauvais and Nate Tomczyk	Ethell Vereen	Morehouse College

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 by 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 lecturer 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 above lists *some* of the people who have been instrumentally involved in GSS.

This year marks the 27th annual Graduate Student Symposium, and we hope the tradition continues well into the future.

A note on talk formats and accessibility

Pre-recorded talks will be streamed live via Zoom and are scheduled to start every 15 minutes with the expectation that the presenter will speak for a maximum of 12 minutes. The remaining 3 minutes are allocated for questions and for participants to transition to the next recording. Additionally, this year there will be two Rapid Fire Sessions, in which each presenter will have 5 minutes to speak. During presentation transitions there will be time to ask a single short question. Longer, more detailed questions should be raised at the Q & A period at the end of the session where all presenters will be available to address questions. Moderators will attempt to ensure that all speakers receive questions during this time.

Furthermore, this year's GSS will be held virtually. As such, all talks and posters will be available for viewing on the University of Georgia's eLearning Commons (eLC) website. During live-streamed sessions, moderators and presenters will be available in online Zoom sessions to address questions and facilitate presentation transitions between each pre-recorded talk. The online Undergraduate Poster Session will be held similarly, with posters accessible on eLC and poster presenters available to answer questions on Zoom.

Current Odum School of Ecology graduate students, faculty, and prospective students will automatically be given access to the eLC content, but other interested parties may contact Nate Tomczyk (nt78066@uga.edu) for access to the eLC presentation content and register for the Zoom sessions at this link. Finally, we ask that you please sign into the GSS Zoom meeting room 5 minutes before the start of any session you plan on attending.

Keynote Speaker

Ethell Vereen, Jr., PhD, MSEH

Assistant Professor

Department of Biology at Morehouse College

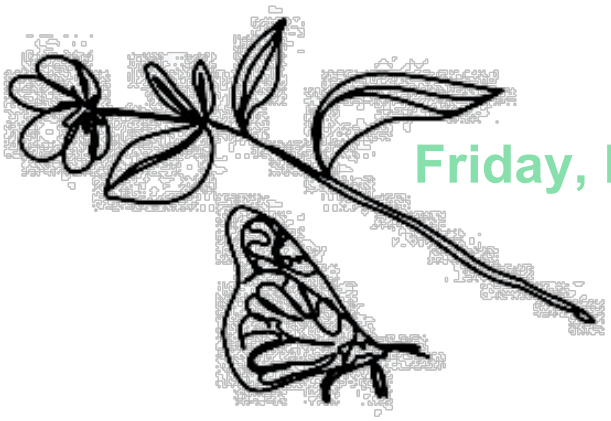
Atlanta, GA

He who learns, teaches.
~Ethiopian proverb

If it doesn't challenge you, it doesn't change you.
~Fred DeVito

Life in Flowing Water

In short, this presentation will address life lessons I've learned as a researcher fascinated by flowing water, rivers and streams. Is there any other molecule so vital, and so problematic, for people? Without water, agriculture vanishes and power plants grind to a halt. In other places, floods wreak havoc. Millions of people every year die from drinking contaminated water. What we know, and how we act is vitally important to the conservation and protection of Earth's water resources. Scientists are leading the way in recognizing new threats to the quality and quantity of freshwater and in producing the scientific knowledge needed by policy makers and governments to act swiftly to confront them. In this presentation, we explore properties of water, and its relationship to life; and discuss contemporary issues and challenges of urban watersheds through a droplet that is the ongoing work of one researcher.



Friday, February 5

10:00-10:15	Dean John Gittleman, Jeffrey Beauvais, Nate Tomczyk	Welcoming remarks

Session I (Moderator: Rebecca Atkins)

10:15-10:30	Claire Teitelbaum	Urbanization and habitat specialization interact to drive infection outcomes for mobile wildlife
10:30-10:45	Laura Naslund	The effects of ecosystem modification and network position on contaminant fluxes from a mountaintop mining-impacted river network
10:45-11:00	Amy A. Briggs	Local vs. site-level effects of algae on coral microbial communities
11:00-11:15	William White	Dams and fried green tomatoes: Natural history and sense of place in conservation decisions
11:15-11:30	**Break**	

Session II (Moderator: Rebecca Atkins)

11:30-11:45	Kelsey J. Solomon	Small decreases in total canopy cover can significantly affect algal communities in southern Appalachian headwater streams
11:45-12:00	Robert L. Richards	The macro-ecology of predator-prey-parasite interactions
12:00-12:15	Kyle Connelly	Getting pumped: Spatial, temporal, and economic drivers of septic tank maintenance intervals in Athens-Clarke County, Georgia
12:15–2:00	**Lunch**	Graduate student lunch with Dr. Ethell Vereen

Rapid Fire Session I (Moderator: TJ Odom)

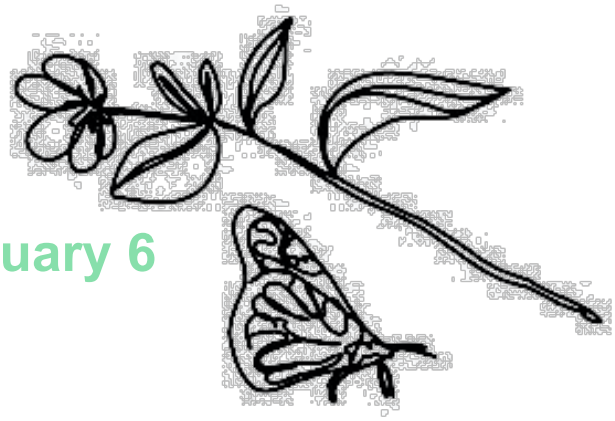
2:00-2:35	Daniel C. Suh	Patterns in host abundance, species richness, and species evenness reveal amphibian communities highly susceptible to Ranavirus
	Christopher R. Smaga	Effects of precocious estrogen on alligator ovarian development
	Carolyn Cummins	Where will carbon go when it enters warmer streams? A test of temperature effects on shredder physiology
	Ashley Ballew	Monarch butterflies: Diet and infection
	Q&A	
2:35–3:00	**Break**	

Session III (Moderator: TJ Odom)

3:00-3:15	Doreen Chaussadas	Impacts of bio-loggers' weight on their carrier: is 5% of the body mass an acceptable charge to put on a birds' back?
3:15-3:30	Kristen J. Zemaitis	Ecotoxicology as a function of ontogenetic shift and diet
3:30-3:45	Anna R. Willoughby	Tourist-provided resources impact park wildlife and their parasite communities
3:45-4:00	**Break**	

Poster Session

4:00–5:30	**Poster Session**



Saturday, February 6

Session IV (Moderator: Carolyn Cummins)

10:00-10:15	Laura V. Kojima	Assessing the consumption risk of American alligators on the Savannah River Site
10:15-10:30	Jeffrey Beauvais	Demographic drivers of coastal water access in South Carolina
10:30-10:45	Kate Sabey	Antibiotic treatment alters gut microbiota plasticity in a wild mammal
10:45-11:00	**Break**	

Rapid Fire Session II (Moderator: Carolyn Cummins)

11:00-11:40	Emily M. Bertucci	Intrinsic and extrinsic factors interact during development to influence telomere dynamics in a long-lived apex predator
	Anna Y. Baynes	Fish habitat preference with changes in flow pattern in the Conasauga River, GA
	Cece Working	Host and environment predict nematode development across temperatures
	Corinne M Sweeney	Radiocesium transfer between aquatic and terrestrial environments
	Q & A	
11:40-12:00	**Break**	

Keynote Address

12:00-12:10	Dr. Erin Lipp	Introduction
12:10-1:10	Dr. Ethell Vereen Jr.	Life in Flowing Water

Abstracts

Monarch butterflies: Diet and infection

Ashley M. Ballew[1,2], Sonia M. Altizer[1,2]

(1) Odum School of Ecology, University of Georgia
(2) Center for the Ecology of Infectious Diseases, University of Georgia

Monarch butterflies undergo a yearly migration that can take them up to 3600 km traveled. In preparation for this journey, monarch butterflies reallocate by entering reproductive diapause and investing more energy into beneficial flight characteristics. We also see a shift in nectaring behavior where monarchs spend more time nectaring as they approach their overwintering site. Similarly, high yearly NDVI averages correlate with larger overwintering monarch populations. Monarch butterflies are experiencing reduced population sizes, and one suggestion is that nectar resources may be partially to blame. Due to changes in land use as well as climate change affecting the severity and frequency of drought, reduced floral resources seems a probable explanation. Although, nectar resources are likely only one part of the problem. The monarch infection with the protozoan parasite *Ophryocytis Elektroscirrha* (OE) is often cited as a contributing factor due to the negative effects of OE on flight ability and survival probability. In this study, we tested the interactive effects of infection and resource limitation on monarch flight, survival, and other fitness characteristics. Infected and healthy adult monarchs were placed in feeding treatments that consisted of either 0.25 percent, 10 percent or 30 percent of a controlled sugar mixture. After completion of the feeding trials, monarchs were flown on a tethered flight mill. Females were then dissected to quantify fecundity and males entered a starvation trial. By looking at the interactive effects of infection and resource limitation, this study contributes to the growing body of literature to understand the demise of the monarch butterfly.

Fish habitat preference with changes in flow pattern in the Conasauga River, GA

Anna Y. Baynes[1,2], Seth J. Wenger[1,2], Mary Freeman[1,2]

(1) Odum School of Ecology, University of Georgia
(2) River Basin Center, University of Georgia

Flow is a key determinant of the ecological structure of a riverine ecosystem, and freshwater organisms such as fish are assumed to be adapted to specific flow regimes. The Conasauga River has experienced a decline in abundance of 26 fish species, resulting in imperilment and local extirpations, which could be due to anthropogenic changes to flow. Testing mechanistic flow effects on fish species can inform flow management to help determine best practices for fish species conservation. This research will investigate how flow patterns alter suitable fish habitat and if they contribute to fish declines in the Conasauga River. I

will create multiple regression models, including zero-inflated Poisson and negative binomial models, to determine if fish species abundance can be predicted by depth and velocity. I will select and run the best model for each species in the Conasauga River and will validate the model using kick-set data from the Etowah River. I will use a hydraulic flow modeling package (HEC-RAS) to construct models of depth and velocity at three shoals in the Conasauga River under different water levels to test the hypothesis that differences in species occurrence and abundance among shoals is explainable by different amounts of suitable habitat, particularly at extreme low flows. I will then complete snorkel surveys at the same shoals to ground truth habitat estimates and fish presence under multiple flow conditions. These results may be used to direct flow management in the Conasauga River and other rivers in the Southeastern United States.

Demographic drivers of coastal water access in South Carolina

Jeffrey Beauvais[1], Jeb Byers[1]

(1) Odum School of Ecology, University of Georgia

The built environment is instrumental in cementing racial hierarchies by inscribing spatial segregation onto the landscape. On the coast, upland privatization enables infrastructure development that provides recreation and property protection, which contribute to appreciating home values and enticing amenities. Certain types of infrastructure, such as docks and marinas, are likely to be highly associated with a privatized upland and I hypothesize that their presence can act as proxies for communal loss of fishing access. Conversely, public infrastructure such as fishing piers, public beach access points, and boat ramps may increase communal fishing access if they are functional and accessible. We analyze the spatial distribution of coastal infrastructure at the census block group level across the six coastal counties of South Carolina to determine if significant relationships exist between public and private components of the built environment and the racial/economic composition of block groups.

Intrinsic and extrinsic factors interact during development to influence telomere dynamics in a long-lived apex predator

Emily M. Bertucci[1,2], Junsoo Bae[2,3], Samantha L. Bock[1,2], Matthew D. Hale[1,2], Jameel Moore[2,4], Phil M. Wilkinson[5], Thomas R. Rainwater[6], John A. Bowden[7], Therese Koal[8], Hai PhamTuan[8], Benjamin B. Parrott[1,2]

(1) Odum School of Ecology, University of Georgia
(2) Savannah River Ecology Laboratory, University of Georgia
(3) Augusta University
(4) Benedict College
(5) Tom Yawkey Wildlife Center
(6) Belle W. Baruch Institute of Coastal Ecology and Forest Science, Clemson University and Tom Yawkey Wildlife Center
(7) Center for Environmental and Human Toxicology, College of Veterinary Medicine, University of Florida
(8) Biocrates Life Sciences

Intrinsic and extrinsic factors interact to produce variation in individual life history and aging trajectories.

Telomeres are structures at the ends of eukaryotic chromosomes that serve critical roles in maintaining genome integrity. In the absence of active maintenance, telomeres shorten with age and serve as a marker of age-related functional declines. Variation in early life telomere length is associated with fitness traits such as reproduction and survival, allowing telomeres to provide insight into the long-term consequences of developmental environments. Here, we assess the influence of extrinsic and intrinsic factors on telomere dynamics in hatchling American alligators (*Alligator mississippiensis*) which were incubated under eight different experimental treatments. We measured telomere length and a panel of eight steroid hormones involved in glucocorticoid signaling and synthesis. We find that both extrinsic and intrinsic factors influence variation in hatchling telomere length. Incubation temperature and exposure to the contaminant DDE interacted to affect telomere length. Clutch was an important driver of variation in both telomere length and body size. Interestingly, body mass was negatively associated with telomere length both across and within clutches. We further examined the potential of glucocorticoid signaling to mediate organismal responses to extrinsic factors and found that contaminant exposure elicits increases in circulating levels of cortisol, which trends negatively, although not significantly, with telomere length. Together, these findings advance our understanding of how environmental factors interact with developing embryos to persistently affect telomere biology in a long-lived species.

Local vs. site-level effects of algae on coral microbial communities

Amy A. Briggs[1], Anya L. Brown[2], Craig W. Osenberg[1]

(1) Odum School of Ecology, University of Georgia
(2) Woods Hole Oceanographic Institution

Microbes influence ecological processes, including the dynamics and health of macro-organisms and their interactions with other species. In coral reefs, microbes mediate negative effects of algae on corals when corals are in contact with algae. However, it is unknown whether these effects extend to larger spatial scales, such as at sites with high algal densities. We investigated how local contact and site-level algae density influenced coral microbial communities in a field study at two islands in French Polynesia, Moorea and Mangareva. At 5 sites at each island we sampled prokaryotic microbial communities associated with corals, macroalgae, turf algae, and water, with coral samples taken from individuals that were isolated from or in contact with turf or macroalgae. The composition of microbial communities on all substrate types varied with site-level macroalgal cover, with coral communities becoming more similar to algal communities at sites with high algal cover and with local algal contact. However, site-level and local algae had antagonistic effects on coral microbiome alpha and beta diversity. Our results indicate that corals are affected by algae outside of their immediate vicinity, and local- and site-level effects of algae can obscure each other's effects when both scales are not considered.

Impacts of bio-loggers' weight on their carrier: is 5 percent of the body mass an acceptable charge to put on a birds' back?

Doreen J. L. Chaussadas[1], Takao Sasaki[1]

(1) Odum School of Ecology, University of Georgia

Recent technological advances enable researchers to collect data (movement, physiological, etc.), which

were difficult to obtain. The idea of using an animal-borne device on a living animal dates as far back as 1962, and since then its use has been applied to many taxa across various disciplines. Yet we must consider its impact on the carrier. The weight of a bird-borne device is typically considered acceptable if it is less than 5 percent of the carrier's body mass. However, we still know very little about this 5 percent 'rule'; is it too light or too heavy and how does it affect flight? In this study, we will use homing pigeons (Columba livia) to explore the effect of device weight on flight performance using a light GPS logger and accelerometer. We will manipulate the device 'weight' by adding bicycle bearing ball (1 g each) to it. Our findings will be valuable not only for researchers working on animal behavior but also for anyone using animal-borne devices in a wide variety of disciplines.

Getting pumped: Spatial, temporal, and economic drivers of septic tank maintenance intervals in Athens-Clarke County, Georgia

Kyle Connelly[1,2], Krista Capps[1,3], Nandita Gaur[4], Jacob McDonald[5]

(1) Odum School of Ecology, University of Georgia
(2) River Basin Center, University of Georgia
(3) Savannah River Ecology Laboratory, University of Georgia
(4) Department of Crop and Soil Sciences, University of Georgia
(5) Institute for Environmental and Spatial Analysis, University of North Georgia at Gainesville

Approximately half of Georgia's population is serviced by an onsite wastewater treatment system (OWTS) and about 16 percent of new housing developments in the Southern U.S. utilize an OWTS. Conventional subsurface septic systems (SSs) are a common OWTS option as they offer an affordable alternative to central sewer system expansion. However, little is known about what influences SS maintenance or performance on the landscape. Poorly sited and/or inadequately maintained SSs can be a source of pathogenic and nutrient pollution, and regular upkeep is paramount to ensuring SSs remain functional. Yet, recommended SS pumping intervals are inconsistently followed because these units are usually located on private land. Consequently, guidelines rely on voluntary SS owner participation, although SS pumping costs are a likely barrier for low-income populations. Therefore, a better understanding of what environmental, temporal, or demographic parameters drive SS maintenance (and thus performance) is needed in order to reduce risks to communities, provide managers guidance, and protect waterways. To address these challenges, this project will, (i) explore relationships between spatio-temporal SS characteristics and county-level SS pumping records from Athens-Clarke County, Georgia to isolate the attributes of pumped and inferred failing SSs, (ii) investigate socio-economic patterns of homeowners who have SS pumping records, (iii) use those relationships to estimate the performance of SSs without pumping records, and (iv) correlate watershed-level SS metrics with in-stream water quality. This analysis will help elucidate where and when SSs may fail and can aid municipal decision makers in equitably prioritizing wastewater treatment infrastructure investments and policies.

Where will carbon go when it enters warmer streams? A test of temperature effects on shredder physiology

Carolyn S. Cummins[1], Amy D. Rosemond[1], Halvor M. Halvorson[2], Amanda T. Rugenski[1], Seth J. Wenger[3], Jonathan P. Benstead[4], Vlad Gulis[5], Phillip M. Bumpers[1], Nathan J. Tomczyk[1]

(1) Odum School of Ecology, University of Georgia
(2) University of Central Arkansas
(3) River Basin Center, University of Georgia
(4) University of Alabama
(5) Coastal Carolina University

Shredding insects and microorganisms are both important for processing terrestrially derived carbon (C) in streams. Shredder versus microbial consumption determines the proportion of stream C that is transformed into particles and consumer biomass versus CO2. Shredders may be vulnerable to rising stream temperatures, but leaf carbon to nitrogen (C:N) ratios may modulate their thermal response. High C:N food may help shredders deal with respiratory C losses, while low C:N food may be advantageous in the face of thermal stress. To investigate the interactive effects of temperature and food quality on shredder physiology, we conducted a streamside channels experiment at the Coweeta Hydrologic Lab (NC, USA). Individuals of the stonefly genus *Tallaperla* were fed either low (*Acer*) or high (*Rhododendron*) C:N leaf fragments in channels that were supplied with flowing water at 5 temperatures (ambient, +1C, +2C, +3C, +4C). We monitored survival weekly and photographed insects before and after the 5-week experiment to measure growth and development. We used regression analyses to determine the effects of temperature and food type on growth, survival, and development. In the +3C and +4C treatments, we observed higher mortality ($p \ll 0.01$) and a higher proportion of insects developing black wingpads ($p \ll 0.01$). Growth rates increased with temperature for insects fed *Acer* ($p < 0.05$), but there was no such relationship for insects fed *Rhododendron*. Our results suggest that higher temperatures may interact with food quality to alter shredder phenology and physiology. Reduced C processing by shredders like *Tallaperla* may have implications for stream C fates in a warmer world.

Assessing the consumption risk of American alligators on the Savannah River Site

Laura V. Kojima[1,2], Benjamin B. Parrott[1,2], Tracey D. Tuberville[2,3]

(1) Odum School of Ecology, University of Georgia
(2) Savannah River Ecology Laboratory, University of Georgia
(3) Warnell School of Forestry and Natural Resources

American alligators (*Alligator mississippiensis*) are mobile, long-lived, carnivorous apex predators that are susceptible to bioaccumulate anthropogenic sourced contaminants over time, as well as, biomagnify contaminants due to their trophic position. In the Department of Energy's Savannah River Site in South Carolina, alligators occupy former nuclear cooling reservoirs (Par Pond and L–Lake) that have residual contamination of mercury. The lakes drain into the Savannah River through channels connecting the reservoirs to the river which opens the possibility for alligators to move from the contaminated lake systems to river systems. This raises a level of concern for hunters who harvest alligators along the Savannah River. Alligators inhabiting the Savannah River Site have been reported to harbor significant levels of mercury, which if consumed, could potentially exceed limits recommended for public consumption. Studies assessing contaminant levels in alligators have primarily examined levels in blood and dermal scute tissue, which are typically not consumed. Thus, there are significant data gaps preventing a thorough assessment of health risk posed by the consumption of alligator meat in the area. Alligator movement represents a mechanism by which significant contaminant loads may exit the Savannah River Site. The current study aims to assess contaminant loads in alligator tail muscle – the

most commonly consumed part of the alligator and investigate the degree to which alligators travel onto and off of the Savannah River Site. Together, these data will inform exposure concerns associate with the public harvest and consumption of alligators in the region.

The effects of ecosystem modification and network position on contaminant fluxes from a mountaintop mining-impacted river network

Laura C. Naslund[1], Jacqueline R. Gerson[2], Alexander C. Brooks[3], Amy D. Rosemond[1], David M. Walters[4], Emily S. Bernhardt [2]

(1) Odum School of Ecology, University of Georgia
(2) Department of Biology, Duke University
(3) Department of Geoscience, Colorado State University
(4) U.S. Geological Survey, Columbia Environmental Research Center

The transport of contaminants from aquatic to terrestrial food webs through aquatic insect vectors has been studied across a range of contaminant classes and aquatic ecosystems. The spatial variation in this insect-mediated contaminant flux throughout river networks has received little attention; despite the observation that the location of insect-mediated contaminant transport can be distant from where contaminants enter streams. We applied a recently published framework of the drivers of insect-mediated contaminant fluxes to develop statistical models of the drivers of selenium (Se) fluxes from a river network draining mountaintop removal coal mines. We predicted that Se flux could be explained by watershed mining extent, network position, and the presence of toe ponds upstream of tributaries draining mine fills. Although watershed mining extent drove insect Se concentration ($p = 0.008$, $R^2 = 0.406$), network position and ponding were the primary drivers of Se flux because of their strong impact on insect production. Insect production at mined mainstem sites was ten times higher, and Se flux was twelve times higher at mined mainstem sites compared to unponded, mined tributaries. Production was seven times higher, and Se flux was twenty-two times higher from ponded, mined tributaries than from unponded, mined tributaries. These results indicate that contaminant concentration in the environment or related variables (e.g., watershed mining extent) are insufficient to predict variation in contaminant flux. Explicit consideration of the factors which drive adult aquatic insect production will improve predictions of contaminant flux and associated exposure risks for terrestrial predators of aquatic insects.

The macro-ecology of predator-prey-parasite interactions

Robert L. Richards[1,2], L. Mike Conner[3], Andrew W. Park[1,2,4], John M. Drake[1,2], Vanessa O. Ezenwa[1,2,4]

(1) Odum School of Ecology, University of Georgia
(2) Center for the Ecology of Infectious Diseases, University of Georgia
(3) Jones Center at Ichauway
(4) Department of Infectious Diseases, University of Georgia

Ecological theory suggests that predators limit parasitism in prey populations. While this hypothesis has been tested repeatedly in manipulative experiments and localized field observations, we have yet to test it at a broader macroecological scale. The Global Mammal Parasite Database (GMPD) provides an opportunity to examine the effect of predation on parasitism in ungulates, a large group of known prey

species, at a global scale. Using generalized linear mixed effects models, here we test the effect of a suite of metrics of mammal predation pressure on parasite prevalence and species richness in these ungulate hosts. We expect that (i) parasitism will decrease with increased predator metric and (ii) this effect will vary by parasite group with parasite groups more likely to be transmitted between prey and predator through predation or range overlap showing a less negative or even positive effect. We find that no metrics of average predation pressure effectively predict parasite species richness of ungulate species. However, parasite prevalence was explained by significant interactions between parasite group and both predator species richness and mean predator body mass at the recorded location. Across both of these interactions arthropods and helminths tended to increase with increasing predator pressure, while bacteria, protozoa, and prions decreased. Viruses were less consistent showing no directional response to predator body mass but substantial increases with predator richness. These findings suggest both that predator pressure impacts parasitism in ungulates and that that effect varies by parasite type.

Antibiotic treatment alters gut microbiota plasticity in a wild mammal

Kate A. Sabey[1,2], Allison Williams[3], Se Jin Song[4], Rob Knight[4], Vanessa O. Ezenwa[1,2,3]

(1) Center for the Ecology of Infectious Diseases, University of Georgia
(2) Department of Infectious Diseases, College of Veterinary Medicine, University of Georgia
(3) Odum School of Ecology, University of Georgia
(4) Center for Microbiome Innovation, University of California San Diego

Phenotypic plasticity, or changes in the expression of host traits over time, can help hosts cope with changing environments. However, since phenotypes are often influenced by multiple environmental factors simultaneously, ecological disturbances might constrain these plastic responses. One host trait that offers the opportunity to test this idea is the gut microbiota, which both contributes to phenotypic plasticity and is sensitive to a wide variety of environmental changes. We examined whether a common anthropogenic microbiota disturbance, antibiotic treatment, altered gut microbiota plasticity in free-ranging Grant's gazelles (*Nanger granti*). We found that while the gut microbiota of control gazelles showed high levels of turnover in community structure over three months, antibiotic treatment dampened this plasticity. Specifically, treatment altered changes in microbial phylum abundance during the first 30 days after treatment. Then, despite microbial abundance profiles recovering to resemble those of control gazelles by 60-days post-treatment, treated gazelles showed reduced plasticity in microbial abundance until 90-days post-treatment. Furthermore, these differing trajectories led to different functional profiles in treated versus control gazelles by the end of the study. These results highlight that ecological disturbances can limit plasticity in the gut microbiota, with potential consequences for a host's capacity to acclimate to environmental change. More broadly, this study also supports that considering ecological context might be key to explaining variation in phenotypic plasticity across hosts.

Effects of precocious estrogen on alligator ovarian development

Christopher R. Smaga[1,2], Benjamin B. Parrott[1,2]

(1) Odum School of Ecology, University of Georgia
(2) Savannah River Ecology Laboratory, University of Georgia

Environmental contaminants, specifically endocrine disrupting compounds (EDCs), often mimic and/or interfere with estrogen signaling during development. Specifically, these compounds can lead to severe abnormalities in the ovaries of animals affected. In American alligators, females from contaminated lakes have altered ovarian structure that can be recapitulated in the lab by early embryonic exposure to 17β-estradiol (E2). However, the mechanism by which early estrogen interferes with ovarian development at a cellular level is unclear, including the effect of timing of exposure. The proposed study tests how precocious estrogen alters the cellular structure and makeup of the alligator ovary by examining and comparing sections of ovaries of females exposed to E2 at different embryonic stages. We aim to determine i) the influence of timing of E2 exposure on ovarian development at a cellular level and ii) the mechanism of how E2 exposure may lead to gonadal abnormalities seen in adult and juvenile females from polluted environments.

Small decreases in total canopy cover can significantly affect algal communities in southern Appalachian headwater streams

Kelsey J. Solomon[1], Maura P. Dudley[1], Nathan J. Tomczyk[1], Rebecca J. Bixby[2], Seth J. Wenger[1,3], Rhett Jackson[4], Catherine M. Pringle[1]

(1) Odum School of Ecology, University of Georgia
(2) Department of Biology, University of New Mexico
(3) River Basin Center, University of Georgia
(4) Warnell School of Forestry and Natural Resources, University of Georgia

A fundamental goal for ecologists is to understand the factors that control the abundance of distribution of organisms, particularly primary producers. Multiple factors (light, nutrients, grazers, etc.) can interact to control stream algal communities. Light regimes in southern Appalachian riparian zones are changing due to shifting forest dynamics and forest management decisions. However, we are unaware if and how crayfish, an important macroconsumer in southern Appalachian headwater streams, affect algal communities, and if their effect may depend rhododendron riparian cover. Thus, the primary objective of this study is to ask: how does top-down control by crayfish interact with decreased canopy cover from riparian rhododendron removal to influence algal community structure and total cell biovolume? To address this question, we utilized a nested crayfish exclusion experiment that was performed within a larger scale rhododendron removal study to understand effects of crayfish on algal communities under both ambient and reduced canopy conditions. We found rhododendron removal increased total cell biovolume and shifted algal community composition from primarily singular and ribbon-forming diatoms (i.e., *Eunotia* spp.) to high-profile, stalk- and chain-forming diatoms (i.e., *Gomphonema* spp., *Encyonema minutum*) and a filamentous chlorophyte (i.e., *Oedogonium* sp.). However, we did not detect an effect of crayfish exclusion or an interaction between rhododendron removal and crayfish exclusion on total cell biovolume or algal community composition, indicating that crayfish likely feed on algal communities indiscriminately in this region. Our results add to the body of research indicating that light availability is the primary control on algal communities in forested headwater streams, and provide insight into the mechanism by which small decreases in total canopy cover can change algal communities.

Patterns in host abundance, species richness, and species evenness reveal amphibian

communities highly susceptible to Ranavirus

Daniel C. Suh[1,2]

(1) Odum School of Ecology, University of Georgia
(2) Center for the Ecology of Infectious Diseases, University of Georgia

The composition of hosts within a community and the overall abundance of hosts play a role in determining parasite transmission potential. Hosts vary in their competence, the propensity to become infected and generate new infections, and parasites rely on a sufficient number of hosts to persist within a community. Existing theory regarding diversity-disease relationships states that host species that are the most abundant are often the most competent as well and are likely to persist the longest when communities lose species. Under this assumption, losses in species richness will leave communities with the most abundant and most competent species, resulting in highly susceptible communities. Using existing data on Ranavirus in larval amphibian communities, we searched for empirical support of this theory. We included measures of species evenness and community competence, the propensity for a community to support a parasite, to further explore this topic. We found that the most competent species were often the most abundant but did not find a relationship between declining species richness and increasing community competence. However, when considering species evenness, we found that communities with high overall abundance usually had low species evenness and were dominated by highly competent species, resulting in communities with high risk of Ranavirus transmission. Our results suggest that the most abundant species are also the most competent, and that species richness alone may not capture the effects of this pattern. Species evenness, rather than species richness alone, may help to describe diversity-disease patterns.

Radiocesium transfer between aquatic and terrestrial environments

Corinne M. Sweeney[1,2], Krista Capps[1], Stacey Lance [1,2]

(1) Odum School of Ecology, University of Georgia
(2) Savannah River Ecology Laboratory, University of Georgia

Fluxes in energy, nutrients and organic materials across habitat boundaries, or spatial subsidies, support food webs and other biogeochemical processes in terrestrial and aquatic environments. Environmental contaminants can also follow the same paths, and move between terrestrial and aquatic environments. However, there are still fundamental gaps in our understanding of the fate and transport of many types of contaminants. Increased interest in renewable energy, including nuclear power, has generated a novel set of energy production byproducts that, in some cases, have become emergent environmental risks. Nuclear events in Chernobyl in 1986 and Fukushima in 2011 exemplify the potential risks of nuclear energy development, though small-scale releases are more common. Releases of radioisotopes into surrounding aquatic and terrestrial ecosystems due to these events have provided a need for further research to understand the transfer and emergent properties of these contaminants as they move through the environment. Radiocesium, a prominent byproduct of nuclear energy, is studied at former nuclear weapons production plant, the Savannah River Site in Aiken, South Carolina. A former nuclear reactor cooling canal, Joyce's Branch, is characterized by high levels of radiocesium contamination in the canal and the surrounding terrestrial environment. It provides a unique opportunity to study the transfer of radiocesium between aquatic and terrestrial environments. Preliminary LIDAR mapping and observations of contaminated soil, fungi and plants have been used to map radiocesium concentrations in the area. We

proposed to collect additional samples for radiocesium and stable isotope analysis to document movement of the contaminant through trophic transfer.

Urbanization and habitat specialization interact to drive infection outcomes for mobile wildlife

Claire S. Teitelbaum[1], Sonia M. Altizer[1,2], Richard J. Hall[1,3]

(1) Odum School of Ecology, University of Georgia
(2) Center for the Ecology of Infectious Diseases, University of Georgia
(3) Department of Infectious Diseases, School of Veterinary Medicine, University of Georgia

Many wildlife species can survive and even thrive in cities, but living in urban areas also alters animal behavior. These changes to behavior can affect population, community, and ecosystem processes, including the transmission and spread of infectious diseases. Many wildlife species move less (e.g., shorter distances, less frequent movements) in urban environments, which can amplify local transmission but can also reduce spatial spread of infection. Moreover, individuals within a single population can adjust to urbanization differently, for example by specializing in either urban or non-urban habitat types. Here, we build a mechanistic metapopulation model to investigate the interactive effects of urbanization and individual habitat specialization on population dynamics and infectious disease dynamics. We find that urbanization has non-linear effects on both survival and infection prevalence, where survival is lowest and infection prevalence is highest in intermediately urbanized landscapes. These results can help clarify the mechanisms driving urbanization-infection relationships and predict the conditions under which urbanization will increase or decrease infection in wildlife.

Dams and fried green tomatoes: Natural history and sense of place in conservation decisions

William A. White[1,2]

(1) Odum School of Ecology, University of Georgia
(2) River Basin Center, University of Georgia

In 2015 the Federal Energy Regulatory Commission (FERC) ordered that a small hydroelectric power plant in Juliette, Georgia, be shut down for failure to construct a fish ladder. Because the dam is no longer operational, there has been some discussion about the potential for its removal; these discussions revealed a historical identity that many residents associate with the dam. In order to assist the Georgia Department of Natural Resources in developing a protection plan for Robust redhorse and other aquatic species habitat, we have been asked to identify public concerns surrounding dam removal and other restoration strategies. Using identity theory and social constructivism, we are conducting a series of semi-structured interviews exploring the relationships between sense of place, definitions of nature, and positions on dam removal and other restoration projects. Interviews will be coded for dominant themes and subsequent inductive analysis. Additionally, we will communicate the pre-dam natural history at the site with the goal of expanding public knowledge and generating support for restoration. Using ArcGIS and historical soil maps, we have recreated the historic landscape of Juliette. This series of maps will allow Juliette residents to explore the natural features of their town that may have existed pre-European contact.

Tourist-provided resources impact park wildlife and their parasite communities

Anna R. Willoughby[1,2], John M. Drake[1,2], Sonia M. Altizer[1,2]

(1) Odum School of Ecology, University of Georgia
(2) Center for the Ecology of Infectious Diseases, University of Georgia

Resources and parasites can regulate populations. Eliminating constraints of one, such as saturating an environment with resources or providing anti-helminthics, may lead to dramatic changes in population dynamics and the health of individuals. Natural parks offer an opportunity to study the impact of human provisioning on wild populations in an otherwise pristine environment. Here, I explore diet-infection relationships of rock squirrels (*Otospermophilus variegatus*), a common human-habituated park mammal. I predict that squirrels in tourism areas will consume more human food and host increased parasite burdens. I will present preliminary work integrating multiple sampling strategies for live-captured squirrels in parks, carcasses along roads, and museums specimens. I assess the degree of human supplementation through isotope analyses of hair to quantify carbon levels, as relatively high C_{13} values indicate the presence of corn syrup in an animal's diet. Squirrel fur, feces, and blood were surveyed for parasite diversity and abundance. I propose mechanisms that resources may have on food-influenced animal behaviors like site residency and burrow-use frequency and the subsequent impacts on host-parasite relationships. I expect gastrointestinal helminths to show decreased diversity, but increased intensity in supplemented hosts, while ectoparasite-borne bacterial infections will increase due to greater flea (e.g. *Diamanus montanus*, *Echidnophaga gallinacea*) infestations. I will describe future work to address my questions about park resource supplementation on individual squirrel health, squirrel populations, and parasite communities. I will end with a discussion of the benefits and challenges of parasite surveillance studies on common wildlife in human-disturbed locations.

Host and environment predict nematode development across temperatures

Cece Working[1,2], Vanessa O. Ezenwa[1,2], Ricardo Holdo[1], Craig W. Osenberg[1]

(1) Odum School of Ecology, University of Georgia
(2) Center for the Ecology of Infectious Diseases, University of Georgia

Parasitic nematodes can disrupt agricultural output and cause significant financial losses for farmers. In this meta-analysis, we aimed to better understand the impact of temperature on nematode development. We evaluated literature to determine the optimal temperatures for development and thermal requirements for survival of nematodes. We predicted that the developmental responses to temperature would vary by host species and location of development. In a phylogenetically corrected meta-analysis, we found that development in plant nematodes and nematodes developing in soil had significant responses to changes in temperature. Future changes in climate may thus impact nematode species differentially. Additional studies are needed to better understand nematode development across a wider variety of species.

Ecotoxicology as a function of ontogenetic shift and diet

Kristen Zemaitis[1], Jeb Byers[1], Benjamin B. Parrott[1,2]

(1) Odum School of Ecology, University of Georgia

(2) Savannah River Ecology Laboratory, University of Georgia

The American alligator (*Alligator mississippiensis*) is an apex predator that can accumulate heavy metals such as mercury (Hg) in high concentrations through prey consumption. While several studies have aimed to assess Hg presence in blood and tissue throughout their range, little is known about the ecological drivers of toxin accumulation in alligators. The objective of this study was to address how ontogenetic dietary shifts interact with site-specific factors (e.g. freshwater v. marine prey availability, trophic level of prey) to influence Hg accumulation. This study was conducted by obtaining blood samples and stomach contents of alligators at three locations to assess trends across unique habitat types: Okefenokee Swamp, GA (acidic blackwater), Jekyll Island, GA (developed barrier island), and the Tom Yawkey Wildlife Refuge, SC (undeveloped barrier island). In addition to Hg analysis, stable isotope analysis was conducted as an ecological tool for interpreting feeding relationships of organisms and determining food web connectivity. Specifically, stable isotope ratios of nitrogen (δ 15N) have been used to estimate trophic position of organisms due to the predictable enrichment of 15N in consumer tissues relative to their diet. We hypothesized a positive relationship between Hg, 15N, and size class that is modulated by ontogenetic dietary shifts and prey base specific to each location. The results of this study may provide evidence that varying levels of Hg in apex predators are directly related to dietary shifts and habitat, furthering the value of alligators as bioindicators of mercury in the locations they inhabit.

Poster Abstracts

Inferring diet of ringtails (Bassariscus astutus) from latrines in human-impacted park habitats

Caroline Aikins[1], Anna R. Willoughby[1,2], Sonia M. Altizer[1,2]

(1) Odum School of Ecology, University of Georgia
(2) Center for the Ecology of Infectious Diseases, University of Georgia

Some animals like raccoons repeatedly defecate in latrines, which can offer opportunities for researchers to study animal diets. Human-provided resources at parks and protected areas often modifies wildlife feeding behavior and distribution in natural landscapes. In Zion National Park (ZNP), ringtails (*Bassariscus astutus*) are nocturnal mammals that use tourist infrastructure and eat human foods by trash scavenging. Ringtails typically defecate as a form of scent signaling at latrine sites (< 20 scat) along boulders or trails. We studied whether building-use by ZNP ringtails predicts their diet and latrine behavior. We examined ZNP latrines (n = 20), split evenly between in two park areas: a staff-only maintenance yard and the Park Lodge which hosts overnight tourists. We hypothesized that 1) ringtail latrines at both sites would show evidence of consumption of human-provided foods, and 2) park lodge latrines would contain greater amounts of anthropogenic content due to the high tourist traffic. Scat samples were processed to determine the relative frequency by weight (rfw) of four diet categories: anthropogenic, vertebrate, invertebrate, and plant. The volume of scat in the building latrines in this study was larger than latrine sizes documented in the literature (x = 35 scat). Maintenance yard latrines contained greater anthropogenic material than Park Lodge latrines (34.7 percent vs. 18.4 percent rfw), but we did not find further evidence of dietary partitioning between the two building areas. The large component of anthropogenic material in scat from ZNP ringtails could indicate opportunities for human-wildlife conflict, including zoonotic parasite transmission.

Walking while parasitized: Effects of a nematode parasite on locomotor activity of horned passalus beetles

Christopher Brandon[1], Christian Hurd[1], David Vasquez[1], Andy Davis[1]

(1) Odum School of Ecology, University of Georgia

Parasites are typically thought to negatively affect their host by draining host resources and energy, thereby leading to reduction in overall activity. One little-studied nematode parasite, *Chondronema passali*, of the horned passalus beetle, *Odontotaenius disjunctus*, may have the reverse effect; prior experiments have revealed that parasitized beetles consume more food than unparasitized individuals. This led us to question if parasitized beetles are also more physically active, and specifically, if their locomotor activity is heightened. We constructed a tabletop arena with individual grid squares to observe beetle locomotor activity. Using wild-caught beetles, we allowed individual beetles to traverse the arena for 5 minutes and recorded the number of grid squares crossed. Beetles were subsequently dissected to determine parasite presence and level of infection on a categorical scale. A total of 140 beetles were examined across three collection stages. Statistical analyses of locomotor activity revealed that the severity of parasite infection predicted locomotor activity, with lightly infected beetles twice as active as those without this parasite. Activity declined with increasing nematode burdens thereafter, but even the group with the most severe burdens did not move less than the group with no parasites. From these results, we conclude that this

parasite does not result in overall reduction in activity, but rather it appears to come with heightened locomotion, which is consistent with prior findings on host food consumption. Alternatively, these results could stem from the fact that more active beetles are simply more likely to contract the parasite. Regardless of the explanation, these results add to our understanding of how host behavior is impacted by parasites.

How parasites influence ecosystems: Studying the varied effects of a trematode parasite on its environment

Will Ellis[1]

(1) Odum School of Ecology, University of Georgia

Historically, parasites have been primarily studied for their negative effects on human and animal health. However, the scientific community is becoming increasingly aware that parasites can have complex effects on their ecological communities, and in some cases can benefit the ecosystem. For this project, we investigated how a trematode parasite influences its host, the Ramshorn snail (*Helisoma trivolvis*), in terms of growth, feeding rates, and mortality. We investigated these effects by comparing infected and uninfected snails under three different temperature conditions in a lab setting. We found that individuals infected with the parasites had a higher mortality rate and on average consumed more food than uninfected snails, with increased effect at higher temperatures. With the knowledge gained by this research we can better understand how some species will react and change due to increased global temperatures.

Tipping streams: Does increased temperature change the balance of carbon and nutrients in food resources?

Mikey Fager[1], Nathan J. Tomczyk[1], Amy D. Rosemond[1], John Benstead[2]

(1) Odum School of Ecology, University of Georgia
(2) Department of Biological Sciences, University of Alabama

Production of aquatic organisms depends on the carbon (C) that comes from terrestrial plants and becomes associated with stream substrates, serving as an important food resource to stream consumers. Its quality (or ratio of carbon to nutrient content) and quantity can be affected by stressors associated with global change. We assessed the effects of warming on the quality of these carbon resources (termed benthic organic matter; BOM), which are decomposed by microorganisms and stream macroinvertebrates. Microbes tend to be elevated in nutrients compared to the BOM that they consume, thus, we hypothesized that an increase in the growth rate of microbes due to warming would result in an increase in the nutrient content of the aggregate material, while stimulated microbial respiration would reduce C. In this study, we warmed a stream and analyzed the nitrogen (N) and C content of different types of BOM relative to a reference stream, in order to test the hypothesis that elevated temperatures will cause a decrease in C:N ratios. We found that while the effect that warming had on the C:N ratios of BOM was statistically non-significant using paired t-tests, patterns were consistent with our hypothesis: three different types of BOM trended lower in C:N in the warmed vs reference stream. Given that previous studies have shown different groups of stream BOM consumers are more or less nutrient vs carbon limited, changes in the relative amounts of carbon and nutrients may have implications for stream consumer growth and production.

Plastic in the urban environment: An exploratory study of microplastics in the Athens, GA community

Amelia Foley[1], Erin Lipp[1]

(1) Department of Environmental Health Science, College of Public Health, University of Georgia

With growing awareness of plastic pollution and its detrimental environmental impacts, there has been increased attention on the study of microplastics. These small debris result from the weathering and breakdown of plastic waste from urban runoff, agricultural runoff, ocean dumping, stormwater, waste management, and other sources. Microplastics pose a threat to both aquatic life and human health due to their chemical makeup, their build-up in the environment, and their suspected long-term biological effects. Given the local and regional ecological significance of the Oconee River, this study aims to collect relevant data regarding microplastics in the Upper Oconee Watershed, which includes 15 creeks and 2 rivers in Athens-Clarke County. This research began with a review of existing literature and an assessment of microplastics databases to form expectations for the water quality of Athens' freshwater systems. Environmental sample collection occurred in Fall 2020, and sample processing and analysis is currently in progress. The goal of this project is to quantify microplastic levels in Athens and compare these results to the expectations established by other researchers in the field. Literature review demonstrated that there were no specific predictors which could estimate Athens' microplastics levels based on factors such as nearby wastewater treatment plants or population levels, which led to a projection of relatively low microplastic concentration levels. Preliminary data already shows greater microplastic levels than expected, and we hope to uncover more new information as data analysis continues.

Morphological root traits and phylogenetic signals in Southern Africa trees and grasses

Niki Gajjar[1], Ricardo Holdo[1]

(1) Odum School of Ecology, University of Georgia

Root morphological traits can reveal water and nutrient acquisition strategies in plants, and thus may help us predict how tree and grass species will respond to changing water availability and rainfall regimes. Furthermore, some root traits, like root tip diameter, have been found to be evolutionarily conserved, but details about the evolutionary histories of other morphological traits in savanna tree and grass species remain less well understood. In a continuation of the preliminary analysis we performed in 2020, we present an updated data set from 23 tree and 20 grass species from the African savanna biome grown under greenhouse conditions. We conducted a formal statistical analysis of tree-grass differences in root morphological traits and an analysis of phylogenetic signals in these traits. We harvested plants, washed roots free of soil, and scanned representative fine root (< 2 mm diameter) subsets at high resolution. We dried and weighed the scanned roots as well as all remaining roots. We used the program SmartRoot for ImageJ to collect diameter, length, and branching pattern data from each scan. From this, we found specific root length, diameter, branching intensity, mean lengths, root length to leaf area ratio, and branching ratio. We then conducted an analysis for phylogenetic signals of these traits, comparing our results with previous work indicating that trees show a strong phylogenetic signal in root vessel anatomy, while grasses do not. This work will allow us to contribute to models of tree-grass dynamics in response to climate change and evaluate the evolutionary relatedness within functional types and clades.

Batrachochytrium dendrobatidis prevalence throughout amphibian species and life stages of varying skin keratin richness

Corinna Hazelrig[1], Michael Yabsley[1,2]

(1) Warnell School of Forestry and Natural Resources, University of Georgia
(2) Southeastern Cooperative Wildlife Disease Study, University of Georgia

The objective of this study is to analyze the difference in the prevalence of *Batrachochytrium dendrobatidis* (*Bd*) between mole salamanders (*Ambystoma talpoideum*) and red-spotted newts (*Notophthalmus viridescens viridescens*) to determine the potential role skin-keratin richness contributes to *Bd* prevalence. In addition, the study hopes to gain further insight into how red-spotted newts act as a vector and reservoir of *Bd*. It is hypothesized that red-spotted newts will have a higher prevalence of *Bd* compared to mole salamanders with increasing prevalence in January. In addition, it is hypothesized that adult amphibians will have a higher prevalence of *Bd* compared to larval life stages. Designated study ponds are currently being dip-netted to collect amphibians to sample via swabbing with cotton and rayon swabs. Other amphibians captured, such as tadpoles and frogs, will be swabbed to increase our understanding of *Bd* in the study ponds. Striped newts (*Notophthalmus perstriatus*) have been sampled as well with a current sample size of 14 as of November 22nd. Skin keratin richness in adult red-spotted newts and paedomorphic mole salamanders will be analyzed through the use of histopathology with a sample size of 3 for each sex. The current total sample size is 216 which is predicted to increase to 450 by the end of January to be analyzed using RT-PCR. By February 2021, it is predicted that the majority of the samples will be processed using RT-PCR and for preliminary data analysis to be completed.

Assessing the response of aquatic detritivore insects to experimental warming

Jessica Mitchell[1], Phillip M. Bumpers[1], Amy D. Rosemond[1]

(1) Odum School of Ecology, University of Georgia

Freshwater macroinvertebrates are essential members of stream food webs and ecosystem structure. It is important to understand how climate warming will affect these communities. The purpose of this study was to observe how aquatic detritivore communities respond to warming by experimentally heating a stream and analyzing changes in insect biomass, abundance, and community structure. We hypothesized that experimental warming would result in a loss in biomass, abundance, and mean body size of detritivores. Overall, major differences in detritivore biomass and abundance were not observed. However, we did observe a significant change in collector-filterer biomass, and community composition between pre-treatment and the first year of warming was slightly different according to NMDS orientation. Additional research that will be gained through the ongoing nature of this study is needed to draw conclusive results on aquatic detritivore responses to warming.