Graduates in Ecology & Evolutionary Biology
at University of Illinois Urbana-Champaign

23rd Annual Graduate Student Symposium

February 6, 2021
Virtual zoom experience
Link: https://go.illinois.edu/GEEB2021

ORGANIZED BY THE GRADUATE STUDENTS IN ECOLOGY AND EVOLUTIONARY BIOLOGY (GEEB)

Co-sponsored by: GEEB, the Program in Ecology, Evolutionary, and Conservation Biology (PEEC), and the Departments of Ecology, Evolution, and Behavior (EEB), Plant Biology, Entomology, and Natural Resources and Environmental Sciences (NRES)

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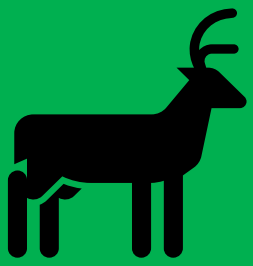

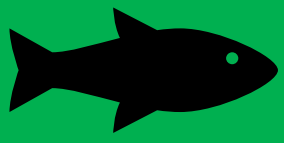


Program Contents

23rd Annual Graduate Student Symposium

The 23rd Annual Graduate Student Symposium will take place on Saturday, February 6, 2021. Talks will begin at 9:30am on Zoom (link below). All talks will be given by University of Illinois graduate students whose research is related to ecology, evolutionary biology, or other closely aligned fields. Talks will end at 2:00p.m., with a 1-hour poster session immediately following. This is the first year GEEB has attempted a virtual symposium, so we appreciate your patience and understanding regarding any delays or technical issues we may encounter.

Goals

The goals of the symposium are twofold:

1. The symposium is an opportunity for students and faculty to gain exposure to graduate student research in ecology, evolution, and related fields. Participation and attendance are encouraged from anyone working in ecology, evolutionary biology, behavior, conservation, environmental sciences, fisheries and wildlife biology, systematics, biogeography, modeling and other related fields.

2. The symposium is an opportunity for graduate students to gain experience presenting research ideas and results to peers in a formal setting and to receive constructive feedback on oral presentations.

Awards

Awards will be presented in four categories:

1. Best Overall Talk
2. Best Talk by a PhD Candidate (post-preliminary exams)
3. Best Talk by a PhD/MS Student (pre-preliminary exams)
4. Best Poster

Announcement of awards will be made after the poster session following the symposium.

Zoom Link

https://go.illinois.edu/GEEB2021

Graduate Students in Ecology and Evolutionary Biology

The symposium is organized by Graduate Students in Ecology and Evolutionary Biology (GEEB). GEEB is a registered student organization (RSO) at the University of Illinois, consisting of graduate students conducting research related to the disciplines of ecology and evolutionary biology. The fundamental goal of this organization is to coordinate and unite graduate students from various departments through their interests in ecology and evolutionary biology. Members of GEEB include students from a wide diversity of campus units; we encourage and welcome students from any campus department to participate in GEEB social and academic activities.

In addition to organizing this annual symposium, other GEEB activities include:

1. Workshops and discussions with invited speakers on issues of interest to GEEB members (e.g. NSF/EPA grant writing skills, job preparation, mentoring)

2. Weekly research presentation and discussions ("Ecolunch")

3. Archives of example grant applications to assist students in obtaining funding

4. Social activities such as happy hours, field trips, charity events and a 'new grad student welcome' event in the fall to encourage inter-department camaraderie among students.

For more information and to receive email announcements about GEEB activities and news items, subscribe to our listserv at **www.life.uiuc.edu/geeb**. Please visit the GEEB website at **www.life.illinois.edu/geeb/.**

Follow us on Twitter @GEEBatUIUC #GEEBSymposium21

GEEB Officers for the 2020-2021 academic year:

President	Kira Long
Treasurer	Sarai Stuart
Symposium Co-Coordinators	Sean Khan Ooi and Jules Chabain
Outreach Chair	Caitlin Bloomer
Ecolunch Coordinator	Sulagna Chakraborty
Social Chair	Hannah Darcy
Webmaster	Sarah Winnicki
Extracurricular Events Chair	Shelby Lawson
Resource Facilitator	Nathan Alexander

Acknowledgments

Sponsorship

We thank the **Program in Ecology and Evolution, and Conservation Biology (PEEC)** for their generosity in providing funding and resources for this event. PEEC is an interdisciplinary, campus-wide program designed to provide individualized training for graduate students for research and teaching careers in ecology and evolutionary biology, and to produce scientists who are both technically competent and broadly educated in ecology, evolution and conservation biology. With approximately 69 faculty participants from 12 departments (in 5 colleges) and allied state agencies, there are many areas of concentration within the broad disciplines of ecology, conservation biology, evolution, and systematics. Students in PEEC can be found working at scales ranging from the molecular level to ecosystem responses to global change. PEEC is committed to supporting graduate education and research through summer research grants, travel grants, and an active seminar series.

We thank the **Department of Ecology, Evolution, and Behavior (EEB)** for their generous sponsorship of the GEEB symposium. There is a long tradition of departmental excellence stemming from Victor E. Shelford (faculty member from 1914 to 1947), who was instrumental in the development of the field of ecology in North America. His emphasis on empirical studies in both academic and research programs has continued to the present. The Department of Ecology, Evolution, and Behavior's faculty teaches and conducts research in behavioral ecology, population & community biology, evolutionary ecology, evolution & development, molecular evolution, population genetics, conservation biology, and phylogenetics. Current research involves a wide range of organisms, from protozoans through mammals. The excellence of EEB faculty is reflected in several recent awards including the Presidential Early Career Award for Scientists and Engineers (the highest honor bestowed by our Government on a young scientist), the Helen Corley Petit Scholar award, the Premio Internazionale 'Felice Ippolito' international prize for Antarctic research, and the Richard & Margaret Romano Professorial Scholarship for leadership and research.. Research facilities include laboratories well equipped for molecular biology, a modern avian behavior laboratory, greenhouses, and nearby research areas with mature forest, restored tall-grass prairies, and extensive areas for manipulative studies.

We appreciate the generous support and sponsorship of the symposium by the **Department of Plant Biology**. The Department of Plant Biology at the University of Illinois has enjoyed a long tradition of identifying, training, and graduating many of the world's top plant biologists. Plant Biology is home t to some of the world's most highly cited researchers and boasts world class facilities for work in the areas of physiology & development, ecology & climate change, systematics & evolution, and biochemistry & genetics. Investigations in the Department of Plant Biology extend from studies of the behavior of subatomic particles in photosynthetic reaction centers to the dynamics and complexity of Paleozoic ecosystems. Researchers and students in this department address many of society's most pressing challenges: managing and conserving our natural resources, assessing effects of climate change on crop yields and ecosystem function, and developing new sources of renewable energy.

We appreciate the generous support of the **Department of Natural Resources and Environmental Sciences (NRES)**. The Department of Natural Resources and Environmental Sciences is an interdisciplinary unit in applied sciences that brings biological, physical, and social scientists together

to understand, teach, and work towards increasing the sustainability of urban, managed, and natural ecosystems from the local to global scale. All NRES educational and research programs center on science, applied ecology, and conservation in a variety of aquatic, terrestrial and human dominated ecosystems. Within that framework, our faculty, staff, and students study a wide variety of ecological systems with emphases on soil, water, people and social systems, forests, plants, animals, and microbes. Much of our research focuses on natural and social processes, such as habitat fragmentation, regulation, dispersal, disturbance, invasion, bioactivity, and decision-making.

We also appreciate the generous support of the **Department of Entomology**. The Department of Entomology was organized in 1909, beginning with S.A. Forbes as its first department head, establishing high standards for research and teaching that have characterized the department ever since. In 2005, the department was rated the top in the nation by the Faculty Scholarly Productivity Index and boasts two faculty members who belong to the National Academy of Sciences, including the editor-in-chief of the prestigious namesake journal, Proceedings of the National Academy of Sciences. Research is conducted as interdisciplinary collaborations with multiple departments and organizations. Additionally, the department participates in many outreach activities in the surrounding community.

Logistical Support

Many thanks to all the individuals who contributed to planning the GEEB Symposium and related activities, without whom this eventful weekend could not exist:

Thank you also to Penny Broga (School of Integrative Biology), Norma Treakle (School of Integrative Biology), Jennifer Barnhart (Plant Biology), Staci Sears-Baxley (School of Integrative Biology), May Berenbaum (Entomology), Kim Leigh (Entomology), Elizabeth Barnabe (School of Integrative Biology), Rosemary Keane (SIB), Karen Claus (NRES), Andrew Suarez (EEB), Andrew Leakey (Plant Biology), Robert Schooley (NRES), and Angela Kent (PEEC) for taking on the massive task of arranging a stimulating recruitment week for all of the prospective students.

Judges

Finally, we thank the faculty, post docs, and graduate students (not listed to maintain anonymity) who generously volunteered their time to provide student-presenters with valuable feedback on their presentations and to help us in selecting the award-winning presentations.

23rd Annual GEEB Symposium 2021

Oral Presentation Schedule

9:30-9:42 GEEB Exec Welcome Speech and Symposium Commencement: **Kira Long**

Pre-Prelim 12-min Presentation

Moderator: *Ratna Karatgi*

9:42-9:54 **Sarah Winnicki:** Egg-laying order, maternal effects, and embryonic growth in American Robins

9:54-10:06 **Evan London:** Assembly and annotation of the white-tailed deer genome (*O. Virginianus*)

10:06-10:18 **Claire Johnson:** Insights into within-season detection and movement of Black-billed and Yellow-billed Cuckoos

10:18-10:30 **Kevin Neumann:** Behavioral variation among juveniles underlies reproductive strategies in three-spined stickleback

10:30-10:35 **Alida de Flamingh**: Introduction to the Champaign County Audubon Society

10:35-10:50 **Break (15-min)**

Post-Prelim 12-min Presentations

Moderator: *Stephany Virrueta Herrera*

10:50-11:02 **Casey Wagnon:** Shrub encroachment creates a dynamic landscape of fear for desert lagomorphs via multiple pathways

11:02-11:14 **Angel Rivera-Colon:** History of secondarily temperate adaptation using genealogical inference in ecologically divergent icefishes

11:14-11:26 **Stephany Virrueta Herrera:** Population genomics of lice on endangered seals

11:26-11:38 **Nicholas Antonson:** Brood engineering through a Goldilocks Principle maximizes fitness in a nest-sharing brood parasite

11:38-11:50 **Kira Long:** Gotta go fast: Suppressed muscle performance and courtship trade-offs in an avian hybrid zone

11:50-1:00 **Lunch Break (Grad and recruit meet-and-greet 12:30-1:00 pm)**

Post-Prelim 12-min Presentations Continued

Moderator: *Scott Clem*

1:00-1:12 **Scott Clem:** Estimating natal origins of North American migratory hover flies (Diptera: Syrphinae) using stable deuterium isotopes (δ^2H)**.**

1:12-1:24 **Colby Behrens:** Divergence in reproductive behavior between two populations of three-spined stickleback

1:24-1:36 **Alice Doucet Beaupré:** Unsupervised discovery of microbial units

1:36-1:48 **Shelby Lawson:** Eavesdropping on heterospecific functional reference calls as a frontline defense against brood parasitism

1:48-2:00 **Hannah Scharf:** Impact of heterospecific and conspecific brood parasitism on host fledging dynamics

2:00-3:00	**Poster Session**
3:00-3:15	**Awards Ceremony and Symposium Closing**

Poster Presentations

Alessa Laserna: Investigation into increased levels of ploidy in *Ambystoma platineum* in three texanum dependent populations in IL with unknown levels of tetralpoidy.

Ratna Karatgi: Operational Sex Ratio and intra-sexual aggression in bluefin killifish

Samantha Capel: Education in the Anthropocene: assessing planetary health education in the US

Jacob Wessels: The impact of variation in the Toll-like receptor 3 gene on epizootic hemorrhagic disease in white-tailed deer (*Odocoileus virginianus*)

Meghan Maciejewski: Investigating the effects of paternal care on offspring boldness

Michael Rivera: Bite force scaling in harvester ants

Jason Karakehian: Methods in studying and obtaining cultures from living fungal spores and conidia

Abstracts for Oral Presentations

Sarah Winnicki[1], T.J. Benson[2], M.E. Hauber[2,3]

[1]Program in Ecology, Evolution, and Conservation Biology, University of Illinois at Urbana-Champaign

[2]Illinois Natural History Survey, Prairie Research Institute, University of Illinois at Urbana-Champaign

[3]Department of Evolution, Ecology, and Behavior, University of Illinois at Urbana-Champaign

EGG-LAYING ORDER, MATERNAL EFFECTS, AND EMBRYONIC GROWTH IN AMERICAN ROBINS

Mothers may preferentially allocate embryonic resources to later-produced offspring to offset the costs of competition with older siblings. To test this hypothesis, we investigated maternal resource allocation and embryonic development of American Robins. We collected eggs on the day of laying to analyze the relative mass of egg components, including yolk and albumen. We also incubated eggs until day 8 to measure heart rate and embryo size (mass, eye diameter, tarsus, wing, and bill length) and relate development to laying order. First laid-eggs were smaller and second-laid eggs had larger yolks than other eggs in the laying order. There was a weak negative relationship between embryo size and pre-incubation egg weight, there was no relationship between laying order and any metric of embryo development. In the future we will further investigate egg constituents, including concentrations of lipids, proteins, and steroid hormones, and relate them to laying order and development.

Evan London[1,2], Alfred Roca[2,1], Jan Novakofski[2,1], Nohra Mateus-Pinilla[1,2]

[1]Illinois Natural History Survey, Prairie Research Institute, University of Illinois at Urbana-Champaign

[2]Department of Animal Science, University of Illinois at Urbana-Champaign

ASSEMBLY AND ANNOTATION OF THE WHITE-TAILED DEER GENOME (*O. VIRGINIANUS*)

White-tailed deer (*Odocoileus virginianus*) has become a species of increasing interest due to the spread of chronic wasting disease, a transmissible spongiform encephalopathy. The current white-tailed deer reference genome was produced using Illumina short-read sequencing alone, which fails to resolve repetitious regions of the genome. This study presents a new assembly produced with long-reads from a single individual on the Pacific Biosciences Sequel II platform using the Redbean assembler. The assembly was then error corrected using both the long- and short accurate Illumina reads from the same individual using Arrow and Pilon respectively. This new assembly has higher contiguity, with 17-fold less fragmentation compared with the current reference, and a contig N50 of 21 megabases, 25 times the length of the *scaffold* N50 of the previous assembly. Future work will be resolving the assembly to the chromosome-level using chromatin contact mapping.

Claire Johnson[1,2], Thomas J. Benson[1,2]

[1]Department of Natural Resources and Environmental Sciences, University of Illinois at Urbana-Champaign

[2]Illinois Natural History Survey, Prairie Research Institute, University of Illinois at Urbana-Champaign

INSIGHTS INTO WITHIN-SEASON DETECTION AND MOVEMENT OF BLACK-BILLED AND YELLOW-BILLED CUCKOOS

Black-billed Cuckoos (*Coccyzus erythropthalmus*) and Yellow-billed Cuckoos (*Coccyzus americanus*) have experienced extensive declines, but, being rare and hard-to-detect, population size and trend estimates are not well supported. Understanding detectability and availability for detection can improve estimation of these metrics. We set out to examine factors influencing detection and the presence of within-season movement dynamics at the home-range and landscape scales. We performed passive and broadcast surveys at 41 sites in northern Illinois in 2019 and 2020 and accounted for effects of survey type, temporal, and environmental covariates on detection, and the influence of habitat and temporal covariates on occupancy and movement. Broadcasts substantially increased detection probability (over 6 and 12 times for Yellow-billed and Black-billed Cuckoos, respectively). There was also strong evidence both species made large movements within their home-ranges and dispersed over the course of the breeding season. These findings have important implications for future monitoring and management efforts.

Kevin Neumann[1], Alison Bell[2]

[1]Program in Ecology, Evolution, and Conservation Biology, University of Illinois at Urbana-Champaign

[2]Department of Evolution, Ecology, and Behavior, University of Illinois at Urbana-Champaign

BEHAVIORAL VARIATION AMONG JUVENILES UNDERLIES REPRODUCTIVE STRATEGIES IN THREE-SPINED STICKLEBACK

Behavioral variation early in life can influence behavior at a later life history stage. Therefore, distinct reproductive and life history strategies may arise early in development. Here, we compared the juvenile behavior of two sympatric populations (whites and commons) of three spined-stickleback (*Gasterosteus aculeatus*) that are phenotypically divergent but occasionally hybridize in the wild. It remains unclear what mechanisms are driving these phenotypic differences. Social behavior may play a role in maintaining reproductive isolation if individuals preferentially assort with conspecifics from the same population. We found that whites were bolder than commons, and that the number of interactions between individuals within groups depended on group composition, i.e. differed between groups comprising individuals from the same or different populations. These results highlight the importance of phenotypic divergence early in life for the emergence of distinct reproductive strategies and how social behavior may contribute to reproductive isolation.

Casey Wagnon[1], Robert L. Schooley[1], Bradley J. Cosentino[2]

[1]Department of Natural Resources and Environmental Sciences, University of Illinois at Urbana-Champaign

[2]Department of Biology, Hobart and William Smith Colleges

SHRUB ENCROACHMENT CREATES A DYNAMIC LANDSCAPE OF FEAR FOR DESERT LAGOMORPHS VIA MULTIPLE PATHWAYS

Shrub encroachment is transforming arid and semiarid grasslands worldwide. Such transitions should influence predator-prey interactions because vegetation cover often affects risk perception by prey and contributes to their landscape of fear. We examined how the landscape of fear of two desert lagomorphs

changes across grassland-to-shrubland gradients in the Chihuahuan Desert of southern New Mexico. We test whether shrub encroachment shapes risk differently for these two lagomorphs because of differences in body size and predator escape tactics. We also examine whether an ecosystem engineer of grasslands mediates risk perception through the creation of escape refuge, and whether trade-offs exist between shrub encroachment and the local reduction of the ecosystem engineer caused by shrub expansion. We illustrate how the expansion of shrubs can create a dynamic landscape of fear for populations of prey species involving direct and indirect pathways contingent on prey body size, escape tactics, and activities of an ecosystem engineer.

Angel G. Rivera-Colon[1], Chris Cheng[1], Julian Catchen[1]

[1]Department of Evolution, Ecology, and Behavior, University of Illinois at Urbana-Champaign

HISTORY OF SECONDARILY TEMPERATE ADAPTATION USING GENEALOGICAL INFERENCE IN ECOLOGICALLY DIVERGENT ICEFISHES

Antarctic icefishes display extreme specialization to the narrow thermal conditions and oxygen concentrations of the Southern Ocean. Despite their exceptional phenotype, a single icefish species can be found in a temperate environment. *Champsocephalus esox* evolved from a cold-specialized ancestor and retains many icefish-defining traits, yet survives in an environment much warmer and less oxygenated than all other icefish species. Using Restriction site-Associated DNA sequencing of the temperate *C. esox* and its Antarctic sister species *Champsocephalus gunnari*, we reconstruct haplotypes across both species and independently infer coalescent trees reflecting the genealogy of each set of haplotypes. Scanning the trees along the chromosomes, we look for differing patterns of genealogy, which reflect the evolutionary history of secondarily temperate adaptation in *C. esox*. We seek to identify if secondarily temperate adaptation evolved after the divergence of these two species, or if the observed genealogy indicates an ancient origin of alternatively adapted haplotypes from a specialized state.

Stephany Virrueta Herrera[1,2]

[1]Program in Ecology, Evolution, and Conservation Biology, University of Illinois at Urbana-Champaign

[2]Illinois Natural History Survey, Prairie Research Institute, University of Illinois at Urbana-Champaign

POPULATION GENOMICS OF LICE ON ENDANGERED SEALS

Parasites comprise a major component of ecosystems, which makes studying parasites on hosts of conservation concern essential for understanding the ecology of at-risk species. Here, we focus on lice from the Lake Saimaa ringed seal, which is one of the most endangered seals in the world. We used genome sequencing of two louse individuals from each of 18 infrapopulations (36 lice total) from 18 individual Lake Saimaa ringed seals to calculate several population genetic metrics of these parasites. All of the analyses indicate that there are significant genetic differences between the distinct infrapopulations. Conversely, lice from the same seal are highly genetically similar, suggesting a substantial level of inbreeding of louse populations on individual seal hosts. These data suggest populations of Lake Saimaa seals do not directly interact on a frequent basis, which could have important implications for the long-term health of these populations and for informing management strategies.

Nicholas Antonson[1], W.M. Schelsky[1,2], D Tolman[3], R.M. Kilner[4], M.E. Hauber[1,2]

[1]Department of Evolution, Ecology, and Behavior, University of Illinois at Urbana-Champaign

[2]Illinois Natural History Survey, Prairie Research Institute, University of Illinois at Urbana-Champaign

[3]Helsinki Institute of Life Science, University of Helsinki

[4]Department of Zoology, University of Cambridge

BROOD ENGINEERING THROUGH A GOLDILOCKS PRINCIPLE MAXIMIZES FITNESS IN A NEST-SHARING BROOD PARASITE

The grand challenge for a non-evictor brood parasite is successfully outcompeting host young to acquire enough care and provisioning during the nesting period to maximize fitness after fledging. However, outcompeting host nestlings is an amorphous task, as competition in the nests of hosts varies by the size, begging intensity, and the number of individual nestlings vying for resources in the nest. Here, we investigated survival of brown-headed cowbird (*Molothrus ater*) nestlings by manipulating brood sizes at hatching within the nests of a single host species, the prothonotary warbler (*Protonotaria citrea*). We found that cowbird survival was highest in intermediate brood sizes. Additionally, we show that cowbirds in larger than optimal brood sizes reduce broods significantly more than cowbirds reared in optimal brood sizes. Such brood reduction toward the optimal brood size suggests that nestling cowbirds may be employing a niche construction strategy to buffer the effects of variable rearing environments.

Kira Long[1], Daniel Tobiansky[2], Franz Goller[3], Michael Braun[4], Jeff Brawn[1], Matthew Fuxjager[2]

[1]Program in Ecology, Evolution, and Conservation Biology, University of Illinois at Urbana-Champaign

[2]Department of Ecology and Evolutionary Biology, Brown University

[3]Institute for Zoophysiology, University of Münster

[4]Department of Vertebrate Zoology, Smithsonian National Museum of Natural History

GOTTA GO FAST: SUPPRESSED MUSCLE PERFORMANCE AND COURTSHIP TRADE-OFFS IN AN AVIAN HYBRID ZONE

Hybrid zones present unique opportunities to observe how sexual selection shapes the evolution of species and complex courtship displays. We investigate the effects of muscle performance on an elaborate courtship display in a hybrid zone of the golden-collared manakin (*Manacus vitellinus*) and white-collared manakin (*M. candei*), two neotropical, lekking birds. During courtship, male manakins perform the 'roll-snap' display by rapidly hitting their wings together, which females assess when choosing a mate. Hybrids have similar roll-snap speeds to golden-collared manakins (≈60 snaps/sec) and are faster than white-collared displays. Paradoxically, hybrids show signs of suppressed muscle performance with slower muscle twitch speeds. Hybrids could be bypassing this physiological constraint by trading endurance for speed: producing shorter displays than golden-collared manakins, but maintaining faster speeds. Our study suggests that performance trade-offs provide a route for sexual selection to shape a behavioral phenotype despite possible

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C. Scott Clem[1], Alexandra Harmon-Threatt[1]

[1]Department of Entomology, University of Illinois at Urbana-Champaign

ESTIMATING NATAL ORIGINS OF NORTH AMERICAN MIGRATORY HOVER FLIES (DIPTERA: SYRPHINAE) USING STABLE DEUTERIUM ISOTOPES (δ^2H).

Understanding the seasonal behaviors of North American hover flies (Diptera: Syrphidae) is a severely understudied yet enormously significant area of research. The adult stages of most hover fly species are important pollinators for a variety of crops while many larvae are crucial biological control agents of soft-bodied pests like aphids. Here I investigate the continental-scale migratory strategies of North American hover flies and attempt to assign natal origins using stable deuterium isotopes (δ^2H) found in wing and leg tissues. Using multiple years of isotope data, I present strong evidence of partial migration in North American aphidophagous hover flies, most notably the species *Eupeodes americanus*. Further, utilizing calibrated hover fly-tissue isoscapes I show that multiple individuals captured in the southeastern United States likely originated in interior Canada. Implications of this behavior in pollination, biological control, and other ecological phenomena will be briefly discussed.

Colby Behrens[1], Alison Bell[1]

[1]Department of Evolution, Ecology, and Behavior, University of Illinois at Urbana-Champaign

DIVERGENCE IN REPRODUCTIVE BEHAVIOR BETWEEN TWO POPULATIONS OF THREE-SPINED STICKLEBACK

Parental care is vital to the survival and health of offspring in numerous species. Despite its importance, little is known about how phenotypic variation in parental care and other reproductive behaviors is produced by the genome. To address this, I am examining two recently diverged populations of three-spined stickleback fish (*Gasterosteus aculeatus*) that vary extensively in their breeding behaviors. Here, I quantify and compare the courtship and parenting behavior of lab-reared males from both populations throughout the reproductive cycle. Results show the populations significantly differ in multiple behaviors throughout nesting, courtship, and parenting stages. Additionally, the data suggest there is an underlying genetic basis to the divergence in breeding behaviors and that it is genetically tractable. These data therefore serve as an important foundation for future genetic studies to link behavioral variation to specific genomic regions.

Alice Doucet Beaupré[1], James O'Dwyer[2], Tom Sharpton[3]

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[2]Department of Plant Biology, University of Illinois at Urbana-Champaign

[3]Department of Microbiology, Oregon State University

UNSUPERVISED DISCOVERY OF MICROBIAL UNITS

In this talk I will present our recent work on the development of an unsupervised machine learning approach we claim discovers contextually relevant microbial units using nothing more than a phylogenetic tree and an OTU abundance table across unannotated samples or microbial communities. The approach uses a novel nonparametric hierarchical generative model with roots in the fields of

computational linguistics and Dirichlet Process priors. The model finds the right levels of description by coherently and hierarchically disentangling the heterogeneity of responses of clades to all underlying factors—factors which can be completely unknown and confounding. This decomposition of the "texture" of all responses present in the dataset naturally gives rise to a preferred compressed set of microbial cladistics units one can use (1) to improve downstream analyses common to microbial ecology, (2) to highlight potential cryptic heterogeneity and confounding factors across samples, (3) to guide the generation of causal hypotheses e.g. about disease states and functions, and (4) to guide the engineering of complex stable mixed cultures.

Shelby Lawson[1], Janice Enos[2], Niko Mendes[1], Sharon Gill[3], Mark Hauber[1]

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[2]Department of Natural Resources and Environmental Sciences, University of Illinois at Urbana-Champaign

[3]Department of Biological Sciences, Western Michigan University

EAVESDROPPING ON HETEROSPECIFIC FUNCTIONAL REFERENCE CALLS AS A FRONTLINE DEFENSE AGAINST BROOD PARASITISM

Yellow Warblers use referential seet calls to warn conspecifics of nearby brood parasitic Brown-headed Cowbirds. Our recent work has found that Red-winged Blackbirds also understand the meaning of Yellow Warbler seet calling. We conducted playbacks of seet calls, cowbird chatter, nest predator calls and non-threatening controls on Yellow Warbler territories and found that blackbirds eavesdropped on some of these playbacks and responded with similar aggression towards seet and chatter calls. In addition, we presented these same playbacks directly at Red-winged black nests across nest stages and found that blackbirds showed similar aggression towards seet and chatter calls, and that aggression was mediated by brood parasitic threat, in that blackbirds responded more strongly to cowbird chatter and seets during incubation, when nests are vulnerable to parasitism, compared to nestling stage. Blackbirds may eavesdrop on the seet calls of yellow warbler neighbors as a frontline defense against parasitism of their own nests.

Hannah Scharf[1], Katharine Stenstrom[1], Mark Hauber[1,2], Wendy Schelsky[2]

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IMPACT OF HETEROSPECIFIC AND CONSPECIFIC BROOD PARASITISM ON HOST FLEDGING DYNAMICS

Fledging is a critical stage of avian development with impacts on fitness, yet remains one of the most understudied components of bird breeding biology. Even less is known about how brood parasitism affects the fledging process in host nestlings. The prothonotary warbler (*Protonotaria citrea*) is a host of the larger, non-evictor brown-headed cowbird (*Molothrus ater*). To determine the effects of parasitism on fledging, nests were experimentally parasitized with a cowbird or warbler egg, compared to control nests, and monitored using RFID systems. Nestlings in heterospecifically parasitized nests but not conspecifically parasitized nests had higher fledging latency when considering the cowbird and fledged at older ages compared to controls. Warbler size was smaller in heterospecifically parasitized nests and

predicted the age at which nestlings fledged, with larger nestlings fledging earlier. While conspecific parasitism had little effect on host fledging, cowbirds impact host fledging phenology, which could influence post-fledging survival.

Abstracts for Posters Presentation

Alessa Laserna[1], Ken Paige[1], Chris Phillips[2]

[1]Department of Evolution, Ecology, and Behavior, University of Illinois at Urbana-Champaign

[2]Illinois Natural History Survey, Prairie Research Institute, University of Illinois at Urbana-Champaign

INVESTIGATION INTO INCREASED LEVELS OF PLOIDY IN *AMBYSTOMA PLATINEUM* IN THREE TEXANUM DEPENDENT POPULATIONS IN IL WITH UNKNOWN LEVELS OF TETRALPOIDY.

The Silvery Salamander, *Ambystoma platineum*, listed as endangered in Illinois, originated from the hybridization between *Ambystoma jeffersonianum* and *Ambystoma laterale*. Due to incompatibility between the genomes of *A. jeffersonianum* and *A.laterale*, *A. platineum* are triploid and reproduce gynogenetically. There is a population of *A. platineum* at Kickapoo State Park (KSP), Vermillion Co., Illinois that has had persistent levels of tetraploidy. Tetraploids in this population are formed by the fertilization of unreduced *A. platinuem* ova by *Ambystoma taxenum* sperm. There are three other populations in Illinois where *A. platineum* are dependent on *A. texanum* as a sexual host suggesting that these three populations could also be experiencing an increase in ploidy. The main purpose of this study is to determine percentage of tetraploids at the other three texanum dependent breeding ponds, and to investigate weather increased water temperature in the ponds is correlated to increased levels of tetraploidy in *A. platineum*.

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OPERATIONAL SEX RATIO AND INTRA-SEXUAL AGGRESSION IN BLUEFIN KILLIFISH

This study investigates the effects of operational sex-ratio on intrasexual competition in bluefin killifish. Sexual selection theory postulates that intrasexual competition (competition within members of the same sex) for mates would be greater among the more abundant sex, i.e., when the operational sex ratio (OSR, ratio of reproductively available males to females) is biased towards one sex. Competition among females in the context of sexual selection has not been studied as much as in males but has recently garnered increased interest. In this study, we investigate whether OSR drives intra-sexual competition in both males and females of a polygynandrous (multi-male and multi-female mating system) species in order to understand the extent to which individuals of both sexes compete for mates.

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EDUCATION IN THE ANTHROPOCENE: ASSESSING PLANETARY HEALTH EDUCATION IN THE US

Mitigating the catastrophic impacts of anthropogenic planetary change requires informed, urgent collective action across all levels of society. Yet, disengagement and disbelief surrounding planetary health threats are pervasive, especially in the United States. We suspected that a major driver is the lack of our current public education addressing the full scope and urgency of the planetary health crisis. We surveyed the current science standards related to planetary health education across US states and territories to (1) determine the concepts covered, degree of anthropogenic interaction described, and urgency conveyed to students, and (2) evaluate which state/territory characteristics are predictive of the education standards. We found that the quality of planetary health education varied widely among US states and territories, but overall there was a severe lack of urgency associated with planetary health concepts. Further, results indicate that the state/territory political affiliation at the time of standard adoption was predictive of the quality of planetary health education for the majority of ranking metrics. We call for a universal science standard to be enacted across all US states and territories that fully addresses the level of urgency of the planetary health crisis without allowing political bias to influence the breadth and depth of concepts covered.

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THE IMPACT OF VARIATION IN THE TOLL-LIKE RECEPTOR 3 GENE ON EPIZOOTIC HEMORRHAGIC DISEASE IN WHITE-TAILED DEER (*ODOCOILEUS VIRGINIANUS*)

Epizootic hemorrhagic disease (EHD) is caused a double-stranded (ds) RNA virus which leads to death in white-tailed deer, often within a few days of infection. Midges transmit the EHD virus (EHDV) to deer. We are studying the effects of genetic variation in Toll-like receptors (TLRs) in white-tailed deer. TLR proteins mediate the innate immune response system, with TLR3 recognizing pathogen-associated molecular patterns in dsRNA viruses, including EHDV. We are sequencing TLR3 in deer that died and tested positive for EHD as well as hunter harvested and roadkill deer from the same counties. We will examine TLR3 genotypes between the two groups. In cattle, there is a signature of balancing selection on TLR3; and we hypothesize that TLR3 genetic diversity may be high in deer due to heterozygote advantage. Preliminary data shows many synonymous and nonsynonymous mutations in the TLR3 gene. Associations between TLR genotypes and EHD may provide insights into the role of genetics on the outbreaks of EHD in deer.

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INVESTIGATING THE EFFECTS OF PATERNAL CARE ON OFFSPRING BOLDNESS

Parental care provides immediate fitness benefits to offspring by improving offspring survival and growth. But care can also have subtle, long-lasting effects on fitness by shaping offspring behavioral traits. Behavioral traits such as boldness may be important for the success of offspring later in life, especially in interactions with predators. However, our knowledge of how care affects offspring behavior is primarily limited to mammals with maternal care. Can paternal behavior also influence the behavioral traits of their offspring? To answer this, we tested for an effect of care on boldness in a fish with male-only care: the threespine stickleback. We compared the behavior of juveniles who either had or had not received care from their fathers in a scototaxis assay, a simple behavioral assay for assessing boldness and risk-taking behaviors.

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BITE FORCE SCALING IN HARVESTER ANTS

Body size is a fundamental trait of all organisms influencing their reproduction and survival. In solitary organisms morphology and function are restricted in relation to size (e.g. scaling constraints), However, in eusocial organisms, separate units that specialize on one role or another - which may relive constraints on morphology. Preliminary research from our lab, in a highly specialized group called trap-jaw ants, suggests polymorphic species (those with workers of different size and shape) have stronger bite forces than monomorphic species of trap-jaw ants (*Odontomachous*), even when corrected for size (Larrabee 2015). It may allow them to break free from some of the scaling constraints that limit solitary organisms. I seek to test the generality of this result by comparing the bite forces among species of seed harvester ants in the genus *Pogonomyrmex*.

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METHODS IN STUDYING AND OBTAINING CULTURES FROM LIVING FUNGAL SPORES AND CONIDIA

Living ascospores and conidia (Ascomycota, Fungi) must be studied in order to accurately characterize them for morphological descriptions and for obtaining pure cultures. In this lightning talk, we describe methods to produce an ascospore deposit from freshly collected field material onto a cover glass for microscopy or growth medium for culture studies and cultivation. Our purpose is to promote standardized, accurate, and thorough morphological characterization of living ascospores, as well as to encourage the routine employment of culture-based methods. This guide is aimed at those who have a basic understanding of ascomycetes, including the various types of ascomata and ascospore liberation by active discharge.