

Natural History and Biodiversity

USING CAMERA TRAPPING TO MONITOR WILDLIFE IN STAFFORD COUNTY, VIRGINIA. Bryan Finch & Werner Wieland, Dept. of Biological Sciences, University of Mary Washington, Fredericksburg, VA. We employed cameras (Spy Point Model IR-5) from June 2013 to April 2014 on a 260 acre partial in Stafford County about 7.5 miles northwest of Fredericksburg. Eighteen cameras were placed in a series of 500 m² quadrants, (one per quadrant) throughout the property. Photographs were examined to identify species, calculate relative abundance (overall and seasonal), and determine activity patterns. Seasons were designated as Summer (Jun., Jul., Aug.), Fall (Sept., Oct., Nov.), Winter (Dec., Jan., Feb.), and Spring (Mar., Apr., May). A total of 3,441 trap days (1 trap day = 18 cameras x # of days - malfunctions) yielded 1,427 photographs of identifiable animals out of a total of 24,357 photographs taken. Fifteen species of birds and mammals were detected including black bear, white-tail deer, coyotes, red and gray fox, and wild turkeys. The overall relative abundance index (RAI) for white-tail deer (9.65) and gray squirrel (3.14) were the highest, followed by wild turkey (1.74), racoon (1.67) and fox (1.67; red and gray combined). All other species observed had an RAI below 1.0. White-tailed deer had the greatest abundance in all seasons (Su = 12.29, F = 12.38, W = 7.22, Sp = 4.41), however, the RAI varied seasonally for other species. The species with the second highest RAI in the Summer and Fall was the grey squirrel (SU = 8.80, F = 3.42) whereas the wild turkey and racoon were the second most abundant in the Winter (1.74 each). Fox were the second most abundant species in the Spring (2.94). Black bear were photographed in the Summer (0.66) and Fall (0.09) only. All photographs included information on ambient temperature and this information is currently being reviewed. This project was supported by the UMW Summer Science Institute.

SALAMANDER MIGRATION AND POPULATION MONITORING IN WARRENTON, VA. Melissa A. Fuerst & Dr. Thomas C. Wood, New Century College, George Mason Univ., Fairfax, VA.22030-4444. The Southeastern United States has the greatest diversity of salamanders in the world with over 75 different species, and the wetland and forest habitats of these creatures have been in decline with increased pollution and habitat destruction. The purpose of this project is to monitor a population of Jefferson (*Ambystoma jeffersonianum*) and Spotted (*Ambystoma maculatum*) Salamanders in a two-year-old constructed ridge-top vernal pool at Environmental Studies on the Piedmont in Warrenton, VA as part of a long term strategy to increase breeding capacity of mole salamanders. Monitoring began in May of 2013 and is currently on-going. In the first year the pool was inhabited by Jefferson and Spotted Salamanders, Wood Frogs, Pickerel Frogs, Green Frogs, Grey Tree Frogs, and Red-Spotted Newts. An estimated 1,300 Wood Frogs and mole salamanders used the pool in its first year, a remarkable number for a newly constructed pool. Because amphibian populations are generally declining, we intend to study this successful population by measuring the growth of each new generation for the next three years. We will correlate growth measurements of the salamanders with soil temperature, water temperature, air temperature, and rainfall data. In this presentation we will summarize use patterns by amphibians for the first two years of this vernal pool; in

early May of 2013, the average size of a larval salamander was 36 mm and in mid-August 2013 the average size was 61 mm.

COMPARISON OF SPECIES-SPECIFIC COURTSHIP SONGS WITHIN A GENUS OF PARASITIC WASPS. Justin P. Bredlau & Karen M. Kester, Integrative Life Sciences & Department of Biology, Virginia Commonwealth University, Richmond VA 23284. In many animals, male courtship songs provide a signal that females use to identify conspecifics and assess mate quality, and thus play an important role in premating isolation based on sexual selection. We compared male courtship songs among species of *Cotesia* (Hymenoptera: Braconidae), which is perhaps the most speciose genus of parasitic wasps. Prior research on four *Cotesia* spp. has demonstrated that songs are generated by wing fanning and pulses in stereotypical patterns. We characterized courtship songs produced by an additional eight of ~80 described species of *Cotesia* that occur in North America. Songs of emergent males from wild caterpillar hosts were recorded with miniature omnidirectional microphones in a noise reduction booth. Pattern, frequency, and duration of song components were analyzed using Raven Pro. Species-specific songs varied significantly in structure and duration of repeating pulse and buzz components, and in fundamental frequency (175 to 328 Hz). Differences in courtship songs loosely mirrored the proposed molecular phylogeny by Michel-Salzat & Whitfield (2004) in that songs of more closely related species were more similar than those of more distantly related species. Courtship song analysis may aid in identifying closely related cryptic species and provide insight into the evolution of this highly diverse and agriculturally important taxon.

WHICH SPECIES OF ANISOPTERA WILL FIRST COLONIZE OR RECOLONIZE A LENTIC HABITAT. Richard S. Groover, Dept. of Environmental Science & Policy, George Mason Univ., Fairfax VA 22030-4444. A six year study of lentic sites in Hanover County, VA, was conducted. First, in a county-wide survey, 26 sites were sampled to identify available dragonflies for colonization. Seven new species not previously reported in Hanover County were found. Nine new or reconstructed impoundments were studied to identify which species first colonized these sites. Predictions may be made based on the data from this research.

LEAST-COST PATH ANALYSIS OF MOVEMENT BY RACCOONS ON THE VIRGINIA BARRIER ISLANDS. R. D. Dueser¹, J. H. Porter² & N. D. Moncrief^{3,1}, Dept. Wildland Resources, Utah State University, Logan, UT 84322,²Dept. Envi. Sci., UVA, Charlottesville, VA 22904, & ³VA Museum of Natural History, Martinsville, VA 24112. Predation by raccoons (*Procyon lotor*) has been implicated in the recent decline of beach-nesting and colonial waterbirds, including species that are endangered and threatened, on the Virginia barrier islands. Raccoons are established on 11 islands and occur sporadically on others. We seek methods to control raccoon access to particular islands during the bird nesting season. We applied least-cost path analysis to quantify potential movements of raccoons in this landscape in order to 1) assess the relative roles of mainland and island populations as sources of immigrants, and 2) identify potential transit pathways for focusing monitoring and control efforts. We estimated movement costs across upland, marsh and open-water habitats. We conclude that inter-island movements are typically less costly for raccoons than immigration

from the mainland, and we identify islands where predator control is most likely to be useful in enhancing avian recruitment. A similar approach can be applied to any landscape where there are distinct differences in the costs of traversing different elements of the landscape.

THE EFFECTS OF URBANIZATION ON THE RELATIONSHIP AMONG BIRDS, TICKS, AND TICK-BORNE PATHOGENS. E. L. Heller, E. L. Walters, & H. D. Gaff, Department of Biological Sciences, Old Dominion University, Norfolk VA 23529. The Hampton Roads region of Virginia is one of the largest urban areas within the Atlantic Flyway, one of four major avian migratory flyways in North America. At least 500 species of birds, 40% of which are of conservation concern, use this flyway; thus, understanding factors affecting species mortality is of paramount concern. By capturing and banding birds at sites of varying levels of urbanization within the Hampton Roads urban matrix, we study the roles birds play in tick-borne pathogen transfer. We set-up mistnets at 5 permanent sites starting July 2012 in order to catch, band, draw blood, and collect ticks from migratory and resident birds. The ticks are identified to species in order to determine what tick species have preferred avian hosts. Both the ticks and avian blood are tested for zoonotic diseases. Results show that the proportion of birds caught with ticks is greater at less urbanized sites than at more urbanized ones and that ticks are more commonly found on ground-foraging species such as *Thryothorus ludovicianus*. The most common ticks collected from birds thus far are larval *Haemaphysalis leporispalustris*. Several ticks collected off birds have tested positive for *Borrelia burgdorferi*. Seasonal trends show that mid-September to early November are the most productive for catching birds, likely due to fall migrations. This study demonstrates how levels of urbanization can influence avian host choice by ticks and increases knowledge of the corresponding relationship between urbanization and disease pathogen prevalence. This study was funded in part by the Virginia Academy of Science and Old Dominion University.

RECONSTRUCTING PATTERNS OF MICROENDEMISM IN MADAGASCAN SEASONALLY DRY TROPICAL FORESTS: DATING THE DIVERGENCE OF FOUR RADIATIONS IN THE MYRRH GENUS, *COMMIPHORA* JACQ. (BURSERACEAE) USING A FIVE-MARKER PHYLOGENY. M. R. Gostel & A. Weeks, George Mason University, Dept. of Environmental Science and Policy, Fairfax, VA 22030-4444. The myrrh genus, *Commiphora* Jacq., is the most species rich in the Burseraceae, yet its diversity is poorly understood. We have sampled approximately 61% of the species in *Commiphora* and over 90% of the species from Madagascar. A nearly comprehensive sampling of Madagascan *Commiphora* has contributed to a molecular phylogeny based on two nuclear (ETS and ITS) and three chloroplast spacers (*ndhF-rpl32*, *psbA-trnH*, and *trnD-trnT*). Previous studies have suggested that *Commiphora* has resulted from two dispersal events from continental Africa to Madagascar; however, we report a minimum of four such dispersal events. We have estimated the timing of these dispersal events and propose areas of endemism using species range and geographic information. Using this information, we perform ancestral area reconstruction to test three biogeographic hypotheses for each of the four radiations of Madagascan *Commiphora*. We identify shortcomings for understanding diversification in Madagascar and suggest mechanisms to overcome such challenges.

ECOLOGICAL REQUIREMENTS OF RARE PLANTS AND THEIR MANAGEMENT IMPLICATIONS FOR THE ABRAMS CREEK WETLANDS IN WINCHESTER AND FREDERICK COUNTY, VIRGINIA. Ashley L. Landes & Woodward S. Bousquet, Environmental Studies Program, Shenandoah University, Winchester, VA 22601. The Abrams Creek Wetlands (ACW) are home to over 20 of Virginia's rare plant species and at least two ecological communities classified as rare on a statewide basis. They were first examined by the Virginia Natural Heritage Program (VNHP) in 1980. Since 1997, Shenandoah University faculty and students in the Environmental Studies Program have been investigating this site in collaboration with the VNHP. Current research is part of a three-year floristic study. The purposes were to compile information from existing literature on the ecological requirements and biogeography of the rare species, prepare a one-page species profile for each, and develop recommendations for managing the Abrams Creek Wetlands to protect its rare flora and ecological communities. During the limited time available, species profiles of four rare plant species in the Abrams Creek Wetlands were compiled. Each presents an analysis of ecological requirements and distribution patterns. Cold springs and calcium-rich soils allow several of the site's rare species to flourish as disjunct populations. Review of the 2007 Abrams Creek Wetlands Preserve Management Plan identified the need to accelerate plans for selective removal of invasive native trees, and the maintenance or implementation of light grazing regimes in several locations.

Posters

SMALL MAMMALS FROM AN ISOLATED, REMNANT CLOUD FOREST IN GUATEMALA. R. P. Eckerlin¹, J. O. Matson², N. Ordóñez Garza³, W. Bulmer¹, & S. Greiman⁴, ¹Natural Sciences Division, Northern VA Comm. Coll., Annandale, VA 22003, ²Department of Biological Sciences, San Jose State Univ., San Jose CA, 95192, ³Department of Biological Sciences, Texas Tech Univ., Lubbock, TX 79409, & ⁴Department of Biology., Univ. North Dakota, Grand Forks, ND 58202. As part of a long term effort to determine the community structure of small mammals inhabiting highland habitats in Guatemala we surveyed a remnant isolated mixed hardwood cloud forest (2640m elevation) at Finca El Pilar, 11km SE La Antigua, Sacatepequez, Guatemala. Removal trapping using a combination of live traps and snap traps and pitfalls for 5 nights (4-9 January 2013) for 968 trap nights and 620 pitfall nights resulted in 46 captures of 10 species of marsupials, shrews, and rodents. This diversity and having one dominant species, *Peromyscus guatemalensis* (n=20, 44%) is similar to other Central American cloud forest sites. Other less abundant species were *Cryptotis goodwini* (n=6), *Sorex veraepacis* (n=5), *Reithrodontomys sumichrasti* (n=4), *Handleyomys rhabdops* (n=3), *Heteromys desmarestianus* (n=2), *Peromyscus beatae* (n=2), *Reithrodontomys mexicanus* (n=2), *Marmosa mexicana* (n=1), and *Nyctomys sumichrasti* (n=1). We evaluated the reproductive condition of these small mammals and collected internal and external parasites. Although the habitat in this cloud forest is somewhat disturbed, the species diversity for this small mammal community remains relatively high as indicated by the presence of 10 species.

FUNCTIONAL GENOMICS OF DEEP SEA MICROBIOMES. Christine A. McGown & Leila J. Hamdan, Microbiome Analysis Center, George Mason Univ.,

Manassas, VA 20110. Deep-sea microbiomes are dominated by unidentified phylotypes with uncharacterized functional roles. Bioinformatics pipelines can predict these functional genetic pathways from environmentally stable DNA sequences. For this study sediment samples from three locations across the Alaska Beaufort Shelf were utilized. The 16S-rRNA genes of the samples were analyzed with multitag pyrosequencing during a previous investigation. Operational Taxonomic Units were selected using the Quantitative Insights Into Microbial Ecology (QIIME) pipeline. Subsequently taxonomical classification and beta-significance indices were derived. Phylogenetic Investigation of Communities by Reconstruction of Unobserved States (PICRUSt) analysis was performed to extract metabolic pathways in the sample set. Results indicate that sulfur metabolism genes were only slightly enriched (0.268%-0.424% abundance) in the samples. Spearman Rank Correlation analysis was used to determine associations between derived metabolic function from PICRUSt and measured abiotic parameters and metabolic rates. Despite relatively low abundance, sulfur metabolism genes correlated significantly with measured sulfate reduction rates at one location where ($p = 0.492$). This study demonstrates the value of incorporating functional genomics in environmental microbiology studies, as it establishes links between environmental factors and the unresolved genetics of an ecosystem.

STATUS OF COMMON WINTERING BIRDS IN THE CENTRAL PIEDMONT OF VIRGINIA. Caryn D. Ross, Sujan M. Henkanaththegedara, & Mark L. Fink, Department of Biological & Environmental Sciences, Longwood University, Farmville VA 23909. Several studies have shown a steady decline of common breeding birds in the eastern United States including Virginia. However, the long-term population dynamics of common wintering birds are poorly understood, especially for the Piedmont region of Virginia. We studied the long-term population dynamics of 12 common wintering birds in central Piedmont using Christmas Bird Count data from five count circles (Darlington Heights, Lynchburg, Warren, Gordonsville & Lake Anna). Linear regression models revealed significant population declines ($p < 0.01$) for Northern Cardinal (*Cardinalis cardinalis*), Carolina Chickadee (*Poecile carolinensis*) and Mourning Dove (*Zenaida macroura*), and significant population increases ($p < 0.0001$) for Eastern Bluebird (*Sialia sialis*), Turkey Vulture (*Cathartes aura*) and Red-tailed Hawk (*Buteo jamaicensis*). Additional analysis comparing average bird densities between Pre- and Post-1980 suggested significant declines ($p < 0.05$) of Northern Cardinal (*C. cardinalis*), Carolina Chickadee (*P. carolinensis*), Tufted Titmouse (*Baeolophus bicolor*) and Mourning Dove (*Z. macroura*). Future research involves expanding the analysis to additional species and studying correlations between population trends and climate variables.

INTER-POPULATION MORPHOLOGICAL VARIATIONS IN ENDANGERED MOHAVE TUI CHUB (SIPHATELES BICOLOR MOHAVENSIS). Brady P. Donovan, Samuel P. Hull, & Sujan M. Henkanaththegedara, Department of Biological & Environmental Sciences, Longwood University, Farmville VA. 23909. The phenotype of an organism is influenced by the habitat it lives in. Translocated populations of threatened species may show rapid divergence of phenotype (e.g. body shape) compared to the source population due to habitat mismatches. Such is the case with endangered Mohave tui chub (*Siphateles bicolor mohavensis*), a desert fish

species restricted to the Mojave River, California. The historical river populations were extirpated by late 1960s and currently there are 6 Mohave tui chub populations as a result of translocation efforts. We studied body shape of tui chubs collected from the parental population and two other translocated populations in man-made habitats. We established 9 body shape landmarks and measured fish (N = 85) for 13 morphometric measurements. We compared body shapes using a series of One-way ANOVAs run on 13 morphometric measurements. We also ran a NMDS to visualize collective response of body shape divergence. ANOVAs revealed that 7 out of 13 morphometric measurements were significantly different among populations ($P < 0.05$) and NMDS resulted in three distinct non-overlapping clusters for three populations ($R^2 = 0.989$; Stress = 0.111). Collectively, our results suggest that both translocated fish populations rapidly diverged to produce a more robust body shape with a short and deep caudal peduncle.

DRAGONFLY PERCH SELECTION RELATED TO PERCH HEIGHT AND LOCATION. Jessica L. Beard & Deborah Waller, Dept. Biology, Old Dominion University, Norfolk, VA 23529. Male dragonflies patrol territories to secure food and mates and rest on perches. Communities of dragonflies at four different lakes were studied for perch selection based on height and distance from the shore during the summer of 2012. Perch distance from shore had no effect on dragonfly perch choice. Tall perches (90 cm) were chosen most frequently by *Libellula incesta*, *Libellula needhami*, and *Celithemis eponia*. Short perches (30 cm) were chosen most frequently by *Brachymesia gravida* and *Erythemis simplicicollis*. *Pachydiplax longipennis* perched on both tall and short perches. Perch choice was not related to dragonfly size. *P. longipennis*, which was the most common dragonfly at all four lakes, won more interspecific contests on tall perches and lost more interspecific contests on short perches. Overall, the amount of time spent on perches was less than one minute on all perches for all species.

THE EFFECT OF GROOMING BY HUMANS ON SOCIAL AND SELF-GROOMING IN HORSES. E. Squires & D. Waller, Dept. of Biol., Old Dominion Univ., Norfolk, VA 23529. Grooming behaviors of primates have been extensively studied, but comparatively little research has been done on the grooming habits of other mammals. The domestic horse provides an interesting subject for studies on grooming behavior because of the role humans play in the grooming process. Domestic horses stabled by private owners generally have all of their grooming needs met by humans who brush and bathe them. In contrast, some domestic horses are free-ranging and have little to no physical contact with humans and take care of their own grooming needs. This study examined the grooming behaviors of domestic horses kept by private owners in a barn on the Eastern Shore of Virginia. These horses were observed in two rounds in the pasture when turned out with other horses; all grooming behaviors exhibited individually and in groups were recorded. In the first round, the horses were not groomed by a human for at least 48 hours prior to observation. In the second round, the horses were groomed within an hour prior to observation. Three sets of rounds, each with 22-32 horses, were conducted. Horses ungroomed by humans groomed themselves more frequently than horses recently groomed, but social grooming was not

affected by human grooming. An enhanced understanding of equine grooming behavior will benefit animal behaviorists, private owners, and all other horse enthusiasts.

THE EFFECT OF ETHANOL ON BLOW FLY LARVAE AND PUPAE. Jessica Sterling & Deborah Waller, Dept. Biology, Old Dominion Univ., Norfolk, VA 23529. Insects are frequently used in forensic investigations to determine postmortem interval (PMI) and circumstances surrounding death. Entomotoxicology includes the investigation of the effects of drugs and toxins on arthropod development. Use of various drugs and toxins prior to death can affect maggot development rates on the corpse, resulting in inaccurate estimations of PMI. The objective of this study was to determine how ethanol affects larval and pupal stages of blow flies (Diptera: Calliphoridae). Cat food baits, which attract carrion feeding insects, were placed in wooded areas to collect blow fly eggs. No insects visited baits during the winter trials, but during the spring baits were colonized by carrion flies and also predators such as spiders. Blow fly larval developmental rates will be related to whether larvae were reared on control baits or baits with different concentrations of ethanol.

Psychology

Posters

FAMILY RESOURCES, ADHERENCE, AND GLYCEMIC CONTROL IN ADOLESCENTS WITH TYPE 1 DIABETES. Patrick J. Weaver¹, Elizabeth M. Robinson¹, Laura J. Caccavale¹, Zachary Radcliff¹, Rusan Chen², Randi Streisand^{3,4}, & Clarissa S. Holmes¹, ¹Virginia Commonwealth University, ²Georgetown University, ³Children's National Medical Center, & ⁴George Washington University. Objective: To examine the relations among family resources (family organization and marital status), adherence, and glycemic control in adolescents with type 1 diabetes. Methods: 257 parent-child dyads were recruited from two pediatric endocrinology clinics. Youth were 11 to 14 years of age (mean age = 12.8, SD = 1.2), primarily Caucasian (69.6%), 22.7% lived in single-parent households, and 77.5% in middle/upper-middle class homes (mean SES = 46.6, SD = 11.7). Results: Structural Equation Modeling revealed an indirect path among family resources, regimen adherence, and glycemic control ($\beta = -0.21$, $p = .004$). A direct relation between family resources and glycemic control was nonsignificant ($\beta = -0.21$, $p = .071$) and demonstrated full mediation of the effect of family resources on glycemic control through regimen adherence. Conclusions: Lower family resources are associated with poorer glycemic control through poorer adherence. Family organization is a modifiable component of family resources that could be the focus of interventions designed to enhance better adherence behaviors and glycemic control.

THE EFFECTS OF DOLL PLAY ON THE FEELINGS OF EFFICACY FOR FUTURE FAMILY AND OCCUPATIONAL ROLES. E. T. Parrott, K. M. Schroeder, & R. B. Dent, Department of Psychology, Washington and Lee University, Lexington, VA. 24450. The present study investigates how playing with dolls that have an amplified focus on a gendered body affect a child's gender typicality of play and a