

process and inflammation. IL13RA2 and COL1A2 were found to amplify the intended target products (gel electrophoresis confirmed). CCL11, AGT, and CSF1 show perfect melt curves, however subsequent gel electrophoresis shows amplification of multiple products indicating non-specific binding or the presence of different versions of the genes. IL5, CSF2, and CSF3 have shown abnormal melt curves, again suggesting either differential expression of gene isotypes.

Natural History and Biodiversity

RESPONSES OF THE CATALPA SPHINX AND ITS PRIMARY PARASITOID TO HIGH AND LOW LEVELS OF IRIDOID GLYCOSIDES. Jessica L. Bray¹, M. Deane Bowers² & Karen Kester¹, ¹Dept. of Biology, Virginia Commonwealth University, Richmond VA 23298 & ²Dept. of Ecology & Evolutionary Biology, University of Colorado, Boulder CO. Caterpillars of the catalpa sphinx, *Ceratomia catalpae*, feed exclusively on *Catalpa*, which contains the iridoid glycosides catalpol and catalposide. Many catalpa trees are heavily infested and defoliated by catalpa caterpillars each year whereas others are untouched. Most populations of catalpa sphinx caterpillars are heavily parasitized by a parasitic wasp, *Cotesia congregata*, but some populations remain unparasitized. We hypothesized that iridoid glycoside levels would vary among trees and that insect responses to relatively high or low levels of these chemicals could explain these patterns of herbivory and parasitism. Iridoid glycoside levels varied among trees and trees with relatively high levels of iridoid glycosides were more heavily defoliated. *Catalpa* moths preferred to oviposit on trees with high iridoid glycoside levels in choice oviposition assays. Caterpillars displayed no preference for high or low iridoid glycoside leaf discs in choice feeding assays. Searching times of *C. congregata* on high and low iridoid glycoside leaf discs did not differ in no choice searching assays. Results indicate that observed variability in herbivory among trees can be explained by moth oviposition preferences for trees with relatively high levels of iridoid glycosides.

BEHAVIORAL RESPONSES OF MALE PARASITIC WASPS TO PLANT CUES WITH RESPECT TO HOST-PLANT COMPLEX ORIGIN. Megan Ayers & Karen Kester, Dept. of Biology, Virginia Commonwealth University, Richmond VA, 23284. The role of plant cues in host location by female parasitic wasps has been well studied; however, very little is known about the use of plant cues by males in mate location. Female *Cotesia congregata* display inherent responses to plant cues that can be modified by post-emergence experience. We hypothesized that males would exhibit similar inherent and modifiable responses to plant cues. Further, we hypothesized that males originating from one of two host-plant complexes, *Manduca sexta* on tobacco or *Ceratomia catalpae* on catalpa, would display different responses to tobacco or catalpa. In no-choice assays, searching responses of both males and females to a non-host plant increased sharply at Day 2 and remained stable through Day 4. In no-choice assays

with tobacco and catalpa, males searched longer on catalpa but their responses were not modified by post-emergence experience. In choice assays, naïve males did not display an orientation preference; however, males given a post-emergence experience with their natal host-plant preferred their natal host-plant complex. Overall, results indicate that post-emergence experience with the natal host plant can facilitate assortative mating on the natal host plant.

THE EFFECTS OF URBANIZATION ON BIRD PARASITISM RATES BY VARIOUS TICK SPECIES. E. L. Heller, C. L. Wright, H. D. Gaff & E. L. Walters, Department of Biological Sciences, Old Dominion University, Norfolk, VA 23529. Coastal Virginia is home to one of the largest urban areas within the Atlantic Flyway, a migration pathway used by at least 500 species of birds. By sampling birds at 5 sites across an urbanization gradient, we tested the effect of increasing urbanization on prevalence of ticks parasitizing birds under two alternative hypotheses: (1) host constraint hypothesis-ticks exhibit lower host specificity in more urbanized areas and (2) environmental constraint hypothesis-birds in more urbanized areas exhibit lower tick burden. We sampled birds using mistnets from August 2012 to August 2014. The proportion of birds parasitized by ticks was significantly (ANOVA, $F=6.221$, $df=2$ $p=0.001$) related to level of urbanization and in general, birds from rural and suburban sites were more heavily parasitized by ticks. This study has the potential to demonstrate how urbanization can influence avian host choice in ticks and the corresponding relationship between urbanization and pathogen prevalence.

Posters

POTENTIAL IMPACTS OF CHANGING CLIMATE ON WINTERING BIRD POPULATIONS OF CENTRAL PIEDMONT VIRGINIA. Eric Salamon, Christopher Labosier & Sujan Henkanaththehedara, Department of Biological & Environmental Sciences, Longwood University, Farmville VA 23909. Previous research has shown that many wintering bird species in Piedmont Virginia is declining over the past 60 years. Forty two out of 76 species analyzed (55%) using Christmas Bird Count data show significant population declines in Central Piedmont. One of the possible causes for these declines is changes in regional climate over the last century. We explored the correlations between long-term population trends of Northern cardinal, Mourning dove and Carolina chickadee, with long-term trends of regional climate variables. We acquired climate data for 1950-2015 from National Climatic Data Center and ran linear regression models to isolate any significant correlations between bird population trends and long-term climatic trends. The climate variables include minimum, average and maximum monthly temperatures, precipitation for months of October, November and December, first frost day, and storm frequency. We found a significant trend for October minimum temperature and a significant correlation between October minimum temperature and decline of Northern cardinals. Future research involves expanding the analysis for more wintering bird species.

POTENTIAL IMPACTS OF INVASIVE CRAYFISH ON NATIVE PIEDMONT CRAYFISH (*CAMBARUS SP. C*) - INSIGHTS FROM LABORATORY EXPERIMENTS. James Wilson, Patricia Hale, Bryan Ditursi, Jackson Wagstaff & Sujan Henkanaththegedara, Department of Biological & Environmental Sciences, Longwood University, Farmville VA 23909. Invasive species are identified as the second greatest cause for imperilment of native species in the United State. In Virginia, there are 137 known invasive taxa, including three invasive crayfish species, and about 50 species of native crayfish. Invasive crayfish can dramatically alter shallow water habitats and cause population declines of native species. We assessed the potential impacts of invasive Virile crayfish (*Orconectes virilis*) on native Piedmont crayfish (*Cambarus sp. C*), focusing on interspecific competition for food and shelter, and survival in sympatry. Native and invasive crayfish were acclimated in a 37.9 L glass aquaria with a central glass divider for 72 hours. Then a food pellet was introduced into the middle of the aquarium after removing the glass divider and feeding and agnostic behavior of both species were monitored. Further, daily monitoring of individual survival of both species was performed for 8 days, and percentage survival was estimated. Feeding trials suggest that native Piedmont crayfish can detect food quickly and “win” the competition for food. However, sympatric survival trails suggest that there is a negative impact of the presence of invasive signal crayfish on survival of native Piedmont crayfish (i.e. a 25% drop of native survival). Future research focuses on scaling up the experiments with mesocosm experiments to generate more realistic information.

INVESTIGATING THE EFFECT OF LARVAL DIET QUALITY ON ADULT BODY SIZE AND MALE HORN MORPHOLOGY IN THE BEETLE *ONTHOPHAGUS TAURUS*. Adrienne J. Muetterties & Patrice M. Ludwig, Biology Department, James Madison University, Harrisonburg, VA. The aim of this experiment is to test the extent to which two resources, commonly used by the sexually dimorphic burrowing dung beetle *Onthophagus taurus*, differ in their effects on adult body size and male horn development. This experiment is based on those done by Moczek (1998) and Hunt and Simmons (2004). Pairs of beetles were placed in breeding tubes with thawed dung, and the brood balls were collected and weighed. With the use of digital imaging and ImageJ, horn length and thorax width were measured for each emerging offspring. Statistical analyses (Mann-Whitney-Wilcoxon, regression, and Chi Square) tested the following hypotheses: there is a difference in the number and mass of brood balls that produce live offspring; there is a difference in the thorax size and horn length of resulting male offspring based on resource quality. Results showed a significant difference between brood ball mass and the type of dung, and additionally a significant difference between the brood ball mass and the sex of the resulting offspring. The Chi Square test revealed that frequencies for emerging offspring were significantly different between the two treatments. Finally, regression analysis showed no significant correlation between brood ball mass and thorax width and horn length. The results of this work implicate that the form in which the resource is available may affect parental

energy investment in offspring, which may in turn affect the sex of the offspring. (Supported by: Betty Jo Loving Butler '58 Endowment for Undergraduate Research Scholarship and Farrell Summer Research Scholarship Award).

THE GLOBAL DISTRIBUTIONS OF HEPATITIS B VIRUS INFECTION, ITS VIRAL GENOTYPES, AND VACCINE COVERAGE: UPDATED HBSAG SEROPREVALENCE ESTIMATES AND ANALYSIS OF DETERMINANTS. John Kim, Max Marzouk, Lei Wang, Peter Masschelin, Ancha Baranova & Aybike Bireldinc, Dept. of Biol., George Mason Univ., Fairfax VA. 22030. Hepatitis B virus infection leads to cirrhosis of the liver and hepatocellular carcinoma (HCC). Despite the discovery of effective vaccine in 1969 against the hepatitis B virus, HBV infection remains a major global health problem with significant amount of prevalence rates throughout different regions of the world. The virus is currently classified into 10 genotypes (A-J) and several subgenotypes. The most severe liver disease predominate in regions with high hepatitis B surface antigen (HBsAg) seroprevalence levels; the most common indicator of HBV infection. In order to precisely assess current and future burdens to global health, we provide updated HBsAg seroprevalence and models illustrating the global distributions of Hepatitis B infection. Distributions of HBV genotypes and national vaccine coverage rates are also integrated into the model. A systematic review of HBsAg seroprevalence between 2005 to 2015 was conducted. World Health Organization reports and recent literature reviews were used to model vaccine coverage and genotype distribution. Data was only collected from articles that meet inclusion and exclusion criteria. HBV prevalence, vaccine coverage, and genotype distribution can be used to prioritize the regions that are in need of help.

PRELIMINARY CHECKLIST OF THE ANTS (HYMENOPTERA: FORMICIDAE) OF VIRGINIA. Kal Ivanov, Department of Recent Invertebrates, Virginia Museum of Natural History, Martinsville VA, 24112. No single treatment of family Formicidae in Virginia has ever been attempted, and the 121 ant species reported from the state, to date, are found scattered throughout the literature. These numbers represent a rather stark underestimation of the number of species expected to occur in the state given the diversity of ecoregions and habitats found in Virginia, and especially when viewed in the light of some recent updates to the ant lists of several neighboring regions. Here I present the first checklist of the ant species known to occur in the state, based primarily on literature records. In addition, I offer new data from materials in the Virginia Museum of Natural History and the Virginia Polytechnic Institute and State University research collections, as well as a small number of recently collected specimens. Currently a total of 124 ant species, including 10 exotics, are reliably reported from the state. These species represent most of the North American groups, lacking only the more tropical members of Cerapachyinae, Ectatomminae, and Pseudomyrmecinae. The most speciose genus in the state is *Formica* (17 spp), followed by *Strumigenys* (13), *Camponotus* (11), *Lasius* (11), and *Aphaenogaster* (9). I also provide distributional information for the few newly recorded species, and I offer brief comparison to species

lists for surrounding states. Increase in collecting effort, coupled with examination of museum specimens is needed to bridge the gap between our current understanding of the ant diversity and distribution in the state and the true diversity of Virginia's myrmecofauna.

WEST VIRGINIA ROCK VOLES. Ralph P. Eckerlin¹, Walter Bulmer¹, Alfred L. Gardner² & Suzanne C. Peurach². ¹Natural Sciences Division, Northern Virginia Community College, Annandale, VA 22003, ²USGS Patuxent Wildlife Center, National Museum of Natural History, Smithsonian Institution, PO Box 37012, Washington, DC 20013. The Rock Vole, *Microtus chrotorhhinus*, is distributed in eastern North America from southern Canada southward in the United States in the Appalachian Mountains to Tennessee. There are few records of the Rock Vole in West Virginia where it is listed as a state imperiled species. We had previously collected one individual on a talus slope at high elevation (ca.1120m) in Pocahontas Co. in the Monongahela National Forest. Beginning in October 2013, using Sherman live traps, we have attempted to collect Rock Voles at that location and learn more about the population size and extent of the population. We have tried a ½ hectare grid and multiple transects through the talus slope at 75-100m intervals. In 450 trap nights we captured only 2 Rock Voles. The two capture sites were about a kilometer apart. Thus, based on these preliminary data, we think the extent of the Rock Vole population is large but the population density is low. Ecological associates captured were *Blarina brevicauda* (14), *Sorex fumeus* (16), *Peromyscus maniculatus* (36), *P. leucopus* (3), *Synaptomys cooperi* (1), *Myodes gapperi* (13), *Napaeozapus insignis* (3), and *Mustela frenata* (1).

FIRST SPECIMENS OF *PEKANIA (MARTES) PENNANTI* (FISHER) FROM VIRGINIA. Nancy D. Moncrief^f & Michael L. Fies², ¹VA Museum of Natural History, Martinsville, VA 24112 & ²VA Dept. Game & Inland Fisheries, P.O. Box 996, Verona, VA 24482. Fishers (*Pekania [Martes] pennanti*) are believed to have occurred in portions of western Virginia before being extirpated in the late 1800s. However no specimen of *P. pennanti* from Virginia has ever been reported in a museum collection, and we were unable to find any museum records for specimens from Virginia, despite extensive electronic searches of museum databases in August 2014 and January 2015. Here we document the presence of this species in Virginia with verified photographic records and with voucher specimens deposited in the Mammal Collection of the Virginia Museum of Natural History. These animals probably have dispersed from populations that are expanding from western Maryland and northeastern West Virginia, following translocation of fishers to northeastern West Virginia in 1969. This report provides a benchmark for future studies of the distribution and abundance of fishers in Virginia.