**Posters**

**Carry-over cascade: linking winter habitat, arrival, breeding, and post-fledging survival in a migratory songbird**

Elizabeth Ames, The Ohio State University; Chris Tonra, The Ohio State University

Every year millions of birds migrate between the wintering grounds, in tropical Central and South America, and the breeding grounds, in temperate North America. Many of these Neotropical migrants complete the various stages of their annual cycle thousands of kilometers apart, and events in one of these stages can influence events in a subsequent stage. Understanding these carry-over effects is fundamental to understanding changes in migratory populations and their conservation, as many are in enigmatic decline. The objective of this study is to explore carry-over effects between wintering and breeding events, and elucidate an unexamined life-cycle stage, the post-fledging period, in a migratory songbird of conservation concern, the Prothonotary Warbler (*Protonotaria citrea*). To achieve this objective, we utilized a network of nest boxes and natural cavities across the 925-acre Hoover Nature Preserve, Columbus, Ohio. There we monitored arrival timing, breeding success, and estimated post-fledging survival in 2016 and 2017. Preliminary results from 2016 show an unusual arrival pattern with mean arrival for after second year males (April 28th) and second year males (April 27th) being approximately the same. We found a surprisingly low rate of fledging success for both natural cavity (37%; n=62) and box (12%; n=25) nests. Post-fledging survival was estimated to be 0.534 with important model variables including age since fledging, female first egg date, and male arrival date. This research helps to fill important gaps in the Prothonotary Warbler’s full annual cycle and provide a critical estimate of the success of a long running nest box program.

**Genomic data distinguish phenotypically distinct birds despite low levels of divergence**

Stepfanie Aguillon, Cornell University; Richard G. Harrison, Cornell University; Irby J. Lovette, Cornell University

The Northern Flicker (*Colaptes auratus*) species complex has been historically well characterized by ornithologists, with particular interest placed on the hybrid zone between red-shafted and yellow-shafted flickers in the US Great Plains. Genetic work using allozymes and mitochondrial DNA has shown low overall differentiation and has been unable to resolve differences between the five main subgroups. This system presents an interesting and tractable opportunity to study a well-known avian hybrid zone using modern genomic techniques. Here, we use a reduced-representation genomic sequencing approach (ddRAD) to characterize genomic differentiation between three of the main subgroups: red-shafted, yellow-shafted, and gilded flickers. We sequenced individuals from populations geographically distant from the hybrid zone and across the species range. We show that genomic data has an increased ability to differentiate the three flickers, despite low levels of overall divergence. Few markers are useful for differentiation, which suggests an important role for frequent ongoing hybridization and/or incomplete lineage sorting in the evolutionary history of this group. Our results indicate more thorough genomic sequencing will be needed to further explore genomic differentiation and the functional genomic bases of the phenotypic differences between the three flickers.

**Effect of dietary antioxidant and fatty acid levels on immune function of European Starlings following endurance flight**

Meredith Anderson, Michigan State University; Jen Owen, Michigan State University; Kristen DeMoranville, University of Rhode Island; Wales Carter, University of Rhode Island; Scott McWilliams, University of Rhode Island

Migration is physiologically taxing to the cardiovascular, musculoskeletal, and respiratory systems. When energy is limited, a migrating bird may allocate energy toward anticipated essential requirements of migration, and away from nonessential functions like the immune system. A byproduct of prolonged exercise is oxidative damage to body tissues, including the immune system; antioxidants in birds’ diets have been shown to mitigate this damage. Migrating birds rely heavily on fat oxidation for energy, an important source being n-6 polyunsaturated fatty-acids (PUFA). We hypothesize that birds that engage in endurance flight and are given a high PUFA and antioxidant-rich diet will be more immunocompetent than birds given lower amounts. Using a landbird migrant, the European Starling (Sturnis vulgaris), we employed a three-way factorial experiment 2 (flight) x 2 (PUFA) x 2 (antioxidant). Birds were randomly assigned to one of two flight treatments: one never flown, the other trained and flown in a wind tunnel. Within each flight treatment birds were assigned one of four diets (1) High antioxidants and high (32%) PUFA (n=23), (2) High antioxidants and low (13%) PUFA (n=20), (3) Low antioxidants and high (32%) PUFA (n=22), and (4) Low antioxidants and low (13%) PUFA (n=18). Blood samples were collected before and after treatments, and the spleen was collected during necropsy. We measured the birds’ constitutive immune function using standard immune assays including absolute and differential leukocyte counts, haptoglobin concentration, hemolysis- hemagglutination assay, and spleen mass and histology. Determining the effect of diet on a migrating bird’s immunocompetence is crucial for making conservation and management decisions about stopover habitat.

**Intron study and evolution of wild songbird MHC genes: minimum essential MHC does not exist**

Antonio Arnaiz-Villena, University Complutense, The Madrid Regional Blood Center; Ester Muñiz, University Complutense, The Madrid Regional Blood Center; Jose Palacio-Gruber, University Complutense, The Madrid Regional Blood Center; Cristina Campos, University Complutense, The Madrid Regional Blood Center; Beatriz Tejedor, University Complutense, The Madrid Regional Blood Center; Manuel Martin-Villa, University Complutense, The Madrid Regional Blood Center; Valentin Ruiz-del-Valle, University Complutense, The Madrid Regional Blood Center

It is established that intron changes do not fit a regular genetic clock model. This makes them not useful for establishing phylogenies. However, study of intron changes on groups of already phylogenetically defined models, like wild songbirds: Genus *Carduelis*, *Serinus* and Tribe Carduelini, in general may give us answers to specific evolutionary questions. In the present work, we have analysed intron 2 from class I major histocompatibility complex (MHC) in order to study evolution of these wild finch MHC genes. Indels, genetic distances, average variability have been studied. A putative expected conservation of intron 2 is not found in these wild birds, instead a large variability is recorded. Although there is a trend to already phylogenetically defined songbird groups to maintain a similar intron 2, too much variability is observed. This is concordant with the hypothesis that most allelic MHC variability is achieved by gene conversion (involving introns) and not by point mutations. In addition, introns length are longer than that described for chicken (*G.gallus*). These findings together with the lack of conservation of vertebrate canonical sites in songbird MHC molecules is discussed on the bases of a very different evolutionary origin and /or evolution.

**An assessment of the effects of West Nile Virus on avian species**

Aislee E. Atkinson, Montana State University & Northwest College; Eric C. Atkinson, Northwest College

West Nile virus (WNV, Flaviviridae), an arbovirus, is a recently (1999) documented North American pathogen affecting both mammals and birds. We characterized over 249 avian samples representing 33 species, 19 families, and 5 orders. We focused on WNV in House Sparrows (*Passer domesticus*) and House Finches (*Haemorhous mexicanus*) in the Clark’s Fork of the Yellowstone River Valley due to similarities in these species’ diets, foraging habits, residency, and range of habitat. We trapped individual birds yearround, sampled saliva (~1 microlitre) using a nylon swab, banded, measured, and released. We used a RAMP reader to test samples. Positive results read more than 30 units, <30 were negative. The sample size for this analysis equaled 110; House Sparrow (56) and House Finch (54) combined. We split samples into three seasons: breeding/young rearing season, March-June; post-fledging season, July-September; and overwinter, October-February. No association between bird species and prevalence of WNV (G = 0.214, df = 1, p = 0.643) and no association between time of year (season) and prevalence of WNV (G = 1.971, df = 2, p = 0.373) were found. However, the variance of viremia was significantly higher in House Finches than in House Sparrows (F53,55 = 10.474, p < 0.001). House Sparrows and House Finches exhibit similar patterns in prevalence as virus reservoirs. The latter, however, show considerable variability in circulating salivary virus loads which, if correlated with blood titers, may be important in determining suitability as maintenance and reservoir hosts, or potentially as superspreaders.

**Mechanisms underlying migratory protandry in the sexes and plumage morphs of the White-throated Sparrow**

Andrew Beauchamp, The University of Western Ontario; Yolanda Morbey, The University of Western Ontario; Christopher Guglielmo, The University of Western Ontario

Migratory protandry is the earlier arrival of males at breeding locations compared to females and may result from faster migration speed, more northerly wintering latitudes, or earlier departure in the spring by males. Migration speed is thought to be positively related to migratory stopover duration, which may in turn be affected by the rate of energy replenishment (refuelling rate) during stopover. This study examines the mechanisms of spring migration timing across the sexes and behaviourally different “white striped” and “tan-striped” plumage morphs of the White-throated Sparrow; with the aim to examine the relationships between migratory timing, migratory speed, stopover duration, stopover refuelling rate, and wintering latitude. Plasma metabolite profiling was used to determine stopover refuelling rate. Body composition was examined using quantitative magnetic resonance analysis. Radio telemetry and the Motus Wildlife Tracking System were used to determine stopover duration, habitat use, and post departure movement. Isotopic analysis was used to compare wintering latitude between sexes and plumage morphs. Sex and plumage morphs were determined genetically. Competitor abundance during stopover was also considered as a co-variate to refuelling rate. Data collection and analysis is currently underway. This study will be the first to concurrently examine migration timing, refuelling rate, stopover duration, and wintering latitude in the White-throated Sparrow. Comparisons between morphs will provide insight into the effect of behaviour on the mechanisms of migratory timing.

**The Canada Jay -- a national bird for Canada**

David Bird, McGill University; Ken Otter, University of Northern British Columbia

After a two-year voting contest to solicit public opinion on which bird species would best represent Canada and to encourage debate among Canadians about the need for a National Bird, the Royal Canadian Geographical Society, in December 2016, selected the “Gray Jay/Whiskeyjack/Mésangeai du Canada” (*Perisoreus canadensis*) from among the top five contenders as their candidate for Canada’s National Bird. Subsequently, this choice was officially endorsed by the Society of Canadian Ornithologists in a November 2016 letter to the federal Minister of National Heritage, Mélanie Joly. A significant number of both ornithologists and the Canadian public, however, felt that while the bird itself was entirely worthy of being a Canadian national symbol, the present official English name, “Gray Jay”, created an impediment, particularly with its American spelling (“gray” instead of the Canadian “grey”). In stark contrast, the original official name, “Canada Jay”, would obviously be a more fitting name. An investigation by D. Strickland in 2017 (Ontario Birds 35: 3-16) into the nomenclatural or taxonomic reasoning behind the American Ornithologist Union (AOU) Checklist Committee’s decision to shift from the use of “Canada Jay” to “Gray Jay” in 1957 revealed precedence to support the notion that the original designate of "Canada Jay" should have been restored in the 1950s when the AOU abandoned separate common name designations for individual subspecies. Thus, the Canadian federal government would therefore not violate biological orthodoxy if it restores the original name “Canada Jay” should it officially declare this species to be the national bird of Canada.

**Foraging and residency behavior of wintering American Kestrels (*Falco sparverius*) in Central Michigan**

Mike Bishop, Alma College; Krista Botting, Alma College; Amber Tuttle, Alma College

Organisms living at the edges of their ranges often exhibit characteristics that deviate from those exhibited by individuals that reside in the core areas of the species’ distribution. Our central Michigan study site (longitude/latitude of 43.38, -84.66) is at the northern limit, in the state and North America, for overwintering American Kestrels (*Falco sparverius*). Between 2007 and 2017 we observed kestrels, from January to March, using radio telemetry, to characterize their foraging and residency behavior. The study area covers approximately 48,000 ha. A total of 27 kestrels were trapped, banded and outfitted with vhf radio-transmitters. The median number of kestrels deployed with transmitters was 3/yr. Kestrel density was estimated to be ~1/10,000ha. Mean longitudinal axis length of the foraging areas was 3.47 km. Mean residency time was 15.25 days. Compared to data collected in the southern part of the kestrel’s US wintering range, northern populations appear to exhibit much lower densities, forage over larger areas, and spend less time in any given area throughout the winter. The assumption is that the driver for this difference is lower resource availability. Future efforts will attempt to address this assumption.

**Avian Foraging Response to Jack Pine (*Pinus banksiana*) Volatile Chemicals**

Katie Bjornen, Northern Michigan University; Alec Lindsay, Northern Michigan University

Omnivorous and insectivorous birds can improve tree and forest health by foraging on herbivorous insects that significantly damage trees. Plants respond to attack by herbivorous insects by producing and releasing volatile organic compounds (hereafter referred to as VOCs). The VOCs function both directly in anti-herbivore defense (e.g., increased secretion of a bitter or toxic chemical) and/or indirectly by attracting predators. Birds that can direct foraging activity to trees with higher insect loads should benefit through increased foraging efficiency. Avian olfactory abilities are understudied, but new research shows some avian taxa use chemical cues to alter navigation, foraging behavior, and individual recognition. We tested the hypothesis that birds detect chemical cues emitted by trees and subsequently orient their foraging effort toward trees with particular “olfactory profiles”. To do this we measured VOCs released from jack pine (*Pinus banksiana*) trees and tested whether avian foraging behavior was preferentially directed to trees that differ in the released VOCs. Further, we experimentally manipulated some trees by releasing different combinations of VOCs and measuring the avian foraging response to each treatment. Here we present results that should prove useful both for further study of avian olfaction and for forestry management.

**Are personality traits repeatable in Golden-crowned Sparrows (*Zonotrichia atricapilla*)?**

Theadora Block, University of California Santa Cruz (UCSC)

Studies of individual animal behavior, or personality, have been an expanding field and established personalities in everything from mollusks to birds to primates. The growing importance of animal personality can be connected to its impacts in understanding why organisms may have less plasticity in their behavior and how evolution would maintain these traits. However, before inferring personality, we should first understand what measurements we use to establish certain behaviors and if they have tangible meaning in the wild. I use behavioral trials to look at individual behavior in Golden-crowned Sparrows (*Zonotrichia atricapilla*) and analyze how consistent their behaviors are within a non-breeding season. Modeling individual behavior within one year found that certain behaviors ranged from 0%-57% repeatability, however, none of these behaviors were statistically significant. Many of these measures are commonly used to make assumptions about individual behavior, so it is surprising that these measures were not significant. This study will continue examining these same individual birds over several years, and see if these trials are able to predict important ecological behaviors in the wild.

**Transmission difference of short and long duration elements in the songs of male clay-colored Thrush in a tropical forest**

Katherine Bonilla-Badilla, Universidad de Costa Rica; Luis Sandoval, Universidad de Costa Rica

In songbirds have been suggested that the presence of songs or elements of different duration within the vocal repertoire of the same species, could be an optimization strategy for sound signal transmission. Given that each type of sound may be used to transmit to different distances or receptors. A bird family where is common the occurrence of sounds of different duration in vocalizations (i.e., elements) is Turdidae. However, the function of these elements within the communication of the species of this family remains poorly study. Our goal was to compare the distance range that long and short-duration elements of Clay-colored Thrush (*Turdus grayi*) songs transmit inside the habitat. We conducted a sound transmission experiment where we broadcast and re-recorded long and short duration elements present in Clay-colored Thrush songs at four distances inside the territories. We found measured four attenuation and degradation measurements (signal-to-noise ratio, tail-to-signal ratio, blur ratio, and excess attenuation) that both elements showed similar patterns of degradation and attenuation with distance. These results suggest that both short and long distance elements are adapted to transmit information for short and long range. Therefore, the presence of both elements within the song is not to communicate with receptors at different distances and its occurrence may be to create a rhythmic contrast in time and frequency to attract female’s attention, and increase therefore his reproductive success.

**Breeding season carry-over effects of forest fragmentation on Wood Thrush (*Hylocichla mustelina*)**

Brendan Boyd, York University; Sue Hayes, York University; Bridget Stutchbury, York University

The Wood Thrush is an iconic forest-dwelling North American long-distance migrant that has been steadily declining for decades. Habitat loss and fragmentation on the breeding grounds has been shown to cause short-term negative effects on immediate breeding success. However, long-term impacts on adults, or carry-over effects, have not been studied, in part due to the difficulty of tracking individuals between periods of their annual cycle, often across large geographic distances. The Motus Wildlife Tracking System is an innovative new automated radio telemetry array that, for the first time, can link breeding fragment size to fall migration and annual survival. Wood Thrush occupying small fragments are expected to experience high rates of brood parasitism and nest predation, which could directly delay fall migration due to timing constraints from late re-nesting or indirectly delay migration if adults are in poorer condition. Wood Thrush are large enough to carry radio-tags with a one year battery life, allowing detection of adults who return within the 100,000 km2 study site in SW Ontario. We captured adult Wood Thrush (n=20) in large and small forest fragments in SW Ontario during the 2016 breeding season and fitted them with coded radio transmitters in order to track their movements using the Motus Wildlife Tracking System. We will present results to test two predictions (1) the initiation of fall migration will occur later for birds breeding in small versus large fragments and (2) there will be a lower annual return rate for birds breeding in small versus large fragments.

**Abundance of fruit-eating birds in agricultural land cover**

Melissa Brady, Michigan State University; Rachael Eaton, Rice University; Shayna Wieferich, Michigan State University; Karen Steensma, Trinity Western University; Deanna Leigh, Western Washington University; Paul Curtis, Cornell University; Heidi Henrichs, Cornell University; Jay Boulanger, Cornell University; Catherine Lindell, Michigan State University

Birds are capable of causing extensive crop damage, especially to fruit crops. Despite this, there is limited knowledge on the species of fruit-eating birds found in different fruit crops across the United States. Moreover, it is unknown whether there is regional variation in species presence for crops grown in different geographical areas. There is also little knowledge about how the abundance patterns for fruit-eating birds vary by crop, region, and with differences in the surrounding land cover. This lack of knowledge can be a hindrance for those trying to find solutions to the problem of bird damage in fruit crops. In this study, we combine several large-scale data sets to investigate fruit-eating bird presence in fruit crops. Bird abundance information was collected via point counts conducted for the Specialty Crop Research Initiative, a multi-year project investigating bird damage across different regions in the United States. Land cover data was collected via the National Agriculture Imagery Program. We first identify fruit-eating bird species found in sweet cherries, blueberries, grapes and apples grown in 3 different regions: Michigan, New York, and the Pacific Northwest. We then investigate the impact that land cover heterogeneity and composition have on the abundance of fruit-eating birds in focal fruit crops. We also separately investigate these effects in several species that were abundant in our study, and have been found in previous studies to cause fruit crop damage: American Robins (*Turdus migratorius*), European Starlings (*Sturnus vulgaris*), and Cedar Waxwings (*Bombycilla cedrorum*).

**Molecular confirmation of hybridization between Northern Parula (*Setophaga americana*) and Cerulean Warbler (*S. cerulea*)**

Courtney L. Brennan, Cleveland Museum of Natural History; Ryan J. Trimbath, University of Akron; Andrew W. Jones, Cleveland Museum of Natural History

Hybridization between Cerulean Warbler (*Setophaga cerulea*) and Northern Parula (*Setophaga americana*) has been suggested from field observations at several sites in eastern North America, but without genetic confirmation these observations were speculative. Here we present the first molecular evidence to confirm hybridization of these closely related species. Suspected hybrids were located in the breeding season in 2014 and 2015 in Cuyahoga Valley National Park, Summit County, Ohio, in an area where both parental species breed. Playback was used to lure the individuals into mist nets where they were banded, feather samples were collected, and morphometric and plumage data were recorded before release. Both birds showed a combination of Cerulean Warbler and Northern Parula plumage characteristics; the overall appearance resembled a Cerulean Warbler but with white eye arcs, a weak yellow wash on the breast, and some yellow mantle feathers suggesting Northern Parula parentage. DNA was extracted from contour feathers and the nuclear MUSK gene and mitochondrial ND2 gene was sequenced. Both individuals' ND2 sequences were identical to Cerulean Warbler sequences, indicating that both had a Cerulean Warbler mother. Sequences from the MUSK gene had several heterozygous loci confirming that they were sired by Northern Parulas. These hybrids were found in an area where Northern Parulas are expanding their breeding range into Cerulean Warbler's range, suggesting that this hybrid combination may become more common.

**Connecting the dots: dustbathing in Japanese Quail through a neoichnological lens**

Erika Brewer, Centre College; Amanda Falk, Centre College

Dust bathing is a behavior that can be observed in many species and occurs when an organism settles into media and tosses it up and over its body. Although there is no evidence of dust bathing in the fossil record, it is a common behavior performed by some species of birds such as the Domestic Chicken (*Gallus gallus domesticus*). Here, Japanese quail (*Coturnix japonica*) is used in a neoichnological study to determine which media conditions are favored for this behavior. Medium-sized sand with 0%-4% water weight is more preferred than saturated substrate with small grain size (i.e., clay). Smaller grain sizes caused the bird to stick to the substrate which decreased the subject’s overall locomotion and ability to dust bathe. Understanding how conditions such as water saturation and grain size affect behavior will support investigations into the fossil record for similar environmental conditions. This allows for a narrow focus on specific environments that are most likely to preserve dust baths. If fossil dust baths are discovered, we will be better able to understand why they occur and what evolutionary benefits avian species gain from dust bathing. As dust bathing is a behavior seen across multiple distantly related avian groups such as Horned Larks, Galapagos Hawks, and Horned Guans, we can use the fossil record to test for deep-seated behavioral homologies, or studying convergent behavioral evolution in deep time. This study will expand upon current neoichnological studies by using different avian subjects, providing a new investigative tool for tracemaking behaviors.

**A low-cost RFID reader and electronics platform for biological research**

Eli Bridge, University of Oklahoma; Jay Wilhelm, Ohio University; Jessica Ruyle, University of Oklahoma; Ian D. Grady, University of Oklahoma; Garret P. Robinson, University of Oklahoma; William F. Oakley, University of Oklahoma; Heather K. Lepage, University of Oklahoma

Radio Frequency Identification (RFID) is a mode of short range wireless communication between an active transceiver and small, passive transponders that can emit a unique identification code and that often function without a battery. RFID has been used to study dozens of bird species ranging from hummingbirds to penguins; however cost and difficulty in implementation have sometimes restricted its use. Our team has built upon seven years of RFID-based field research to design a cheap and versatile RFID reader for use in biological research. The primary circuit board is derived from an Arduino M0, which is a hobbyist electronics platform designed to allow students and non-engineers to learn about and use microprocessors. We have taken the basic M0 design and added an RFID reader, an SD card interface, and a clock to produce a device that can serve as a simple data logger or be modified to incorporate additional sensors (e.g., temperature, GPS, weighing scales) and output controls (e.g., motors, lights, speakers, etc), which would allow the reader to coordinate complex systems such as cognitive testing apparatus and food dispensers. The new reader also has provisions for wireless communication allowing for real time data acquisition and remote control of operating parameters. We offer this design as an open-source do-it-yourself project with simple instructions and sources for all components, but we also plan to work with a vendor to make these devices available to biologists at a low cost.

**Metal Levels in Blood of Shorebirds reflect Levels in their prey (Horseshoe Crab Eggs)**

Joanna Burger, Rutgers University; Nellie Tsipoura, NJ Audubon; Michael Gochfeld, Rutgers University

Understanding the relationship between metal level in predators and their prey is an important issue, and is usually difficult to determine because birds eat a variety of prey. However, shorebirds that stop over during spring migration along Delaware Bay (NJ) stay for only 2-3 weeks, and eat mainly horseshoe crab (*Limulus polyphemus*) eggs. We examined the relationship between metal levels in horseshoe crab eggs and those in the blood of red knot (*Calidris canutus rufa*), sanderling (*Calidris alba*) and semipalmated sandpiper (*Calidris pusilla*) from Delaware Bay. We also examine the relationship between metal levels in blood and feathers because feather are easier to collect, and there is a rich literature on metal levels in feathers. For all three species, the levels of arsenic, cadmium, chromium, lead and mercury in blood were highly correlated with the levels of metals in the eggs of horseshoe crabs. This indicates that the levels in blood of these shorebirds quickly reflect those in their prey. Semipalmated sandpipers had the lowest levels of arsenic in blood, and the highest levels of arsenic in feathers, compared to the other species. Semipalmated sandpipers have a diet that includes some marsh invertebrates. The levels of cadmium and chromium in blood were significantly higher in knots than other species. For all of the metals except arsenic, the ratio of levels in blood/levels in feathers were similar among species. For arsenic, the ratio of levels in blood/feathers were significantly lower in semipalmated sandpipers than the other species.

**A rapid measure of breeding productivity for the Canada Warbler (*Cardellina canadensis*)**

Christian Burns, Plymouth State University; Leonard R. Reitsma, Plymouth State University

Breeding productivity can be measured as the number of offspring produced by a population annually. Assessing productivity can be time intensive, or lacking demographic and habitat information. Efficient, and comparatively comprehensive measures of productivity are needed to inform conservation efforts for declining species. The Canada Warbler (*Cardellina canadensis*) is a currently declining migrant. We test a rapid method for assessing productivity, while obtaining information on demographic-specific fledging rates, return rates, and habitat measures. This study was in Canaan, New Hampshire on two “reference” plots and 3 non-reference plots. Males were aged and banded on each plot. Sites were revisited once fledging occurred on the reference plots, monitored intensively for 16 consecutive years, to measure fledging success. The male was considered having successfully fledged young if a fledgling or food provisioning by him or a female at the capture site was observed. If no provisioning, fledgling, or adult was observed, the male was considered unsuccessful. Habitat characteristics were also recorded per site. The captures and analyses were performed within two field days per plot, by two researchers. In 2015, older birds were more successful (df = 1, χ2 = 1.55, p = 0.213). Of the 2016 birds, 37% were returnees, and all were more successful on territories with denser shrub-level vegetation (df = 69, t = -1.675, p = 0.0491). In 2017, data from multiple sites across the breeding range will be collected and analyzed to compare habitat structure, demographics, and breeding success of populations throughout the range.

**Adult bobolink dispersal following hay harvest during the breeding season**

Andrew Campomizzi, Bird Ecology and Conservation Ontario; Zoe Lebrun-Southcott, Bird Ecology and Conservation Ontario

Bobolink (*Dolichonyx oryzivorus*) rely primarily on agricultural grasslands for breeding habitat in North America. Hay fields are often harvested in June, while bobolink are nesting, causing nest failure. Adult dispersal after the hay harvest is not well understood, but quantifying habitat use and re-nesting is important for conservation planning. Through a pilot field project, we radio-tracked 5 Bobolink in southern Ontario after the harvest in 2016. We tracked 3 males for 41 to 43 days after the harvest; the other 2 birds (1 male, 1 female) presumably dispersed beyond our search range < 4 days after the harvest. The 3 adults we tracked for > 1 month did not show signs of re-nesting and were often < 800 m from the capture location; maximum distance was 2.2 km. Birds primarily used a nearby uncut hay field and a fallow field; both had breeding Bobolink. In our follow-up research, we plan to track Bobolink dispersal using hand-held antennas (for short-distance movements) and the Motus Wildlife Tracking System (for long-distance movements). Both methods enable assessment of habitat use and hand-held antennas will enable quantification of re-nesting. If few Bobolink re-nest after hay harvesting, then fields harvested before young fledge likely result in annual fecundity of near 0. Land cover types used by displaced birds may be important for providing refuge and ensuring most adults can breed again the following year. Improving our understanding of how breeding bobolink respond to agricultural practices during the breeding season is important for planning conservation actions.

**Management Implications of Differential Productivity Rates at Great Lakes Piping Plover Nest Sites.**

Vincent Cavalieri, U.S. Fish and Wildlife Service; Francesca Cuthbert, University of Minnesota

The Great Lakes population of Piping Plovers was listed as an endangered species by the U.S. Fish and Wildlife Service after the population dropped to less than 20 pairs in the mid-1980s. Intense management in the 30 years since listing has helped the population rebound to 75 pairs in 2016. Significant barriers to recovery, such as pressure from human recreation and predation on adults and chicks remain however. Some Great Lakes piping plover breeding sites have much higher fledging rates than others. We evaluate productivity over time for all nest sites. We then analyze the influence of a suite of variables, such as beach ownership, beach size and amount of recreation pressure on fledging rates. Results will be used to inform management decisions.

**Vocal, color and genetic variation across a wide hybrid zone in Andean warblers**

Laura Céspedes, Universidad de los Andes; Elisa Bonaccorso, Universidad San Francisco de Quito; Daniel Cadena, Universidad de los Andes; María Alejandra Castro, Universidad Central de Venezuela; Andrés Cuervo, Instituto de Investigación de Recursos Biológicos Alexander Von Humboldt; Javier Gómez, Universidad de los Andes; Jorge Pérez, Universidad Central de Venezuela; Christopher Witt, University of New Mexico

Studying variation in communication-related traits (color and song) across hybrid zones has importantly contributed to understanding how isolating barriers emerge during speciation. In this study, we characterized a putative hybrid zone between two closely related Andean Warblers, *Myioborus ornatus chrysops* and *Myioborus melanocephalus* *ruficoronatus*, using genetic, coloration, and song data. Geographic ranges of these species abut around the Colombia-Ecuador border and specimens from the region exhibit intermediate phenotypes suggesting hybridization, but descriptions of patterns of variation were lacking. We collected recordings of vocalizations and specimens in more than 20 localities across a ca. 400 km transect around the Colombia-Ecuador border. On each study skin, we measured the area of color patches and quantified color hue. To describe acoustic variation, we measured spectral and temporal parameters from recorded songs. To describe genetic variation, we sequenced the ND2 mitochondrial gene. We extended genetic sampling to encompass all known populations of this complex from Venezuela to Bolivia to describe phylogeographic structure. This putative hybrid zone is characterized by low genetic structure and contrasting patterns of variation in different color patches. Acoustic divergence is subtle and variation across sampling localities is complex. Specimens from the hybrid zone and northern populations of *M. melanocephalus* belong to a genetic group more closely related to *M. ornatus* than to southern *M. melanocephalus* populations. We are collecting genomic data that will contribute to understanding origins of this putative hybrid zone and allow to test for the role of selection on shaping variation in communication-related traits.

**Habitat preference and movement in lek and foraging grounds in the White-collared Manakin (*Manacus candei*)**

Mathieu Charette, Toucan Ridge Ecology and Education Society; Hannah Soder, Toucan Ridge Ecology and Education Society

Manakins are small, mainly frugivorous Neotropical passerine birds in the family Pipiridae(McKay et. al. 2010). They are found in moist forest edges (Blake and Loiselle 2002) in lowland broadleaf forests in Belize, Central America. The White-collared Manakins (*Manacus candei*) are one of the least studied of the Manakins and little is known on their selection and use of lekking and foraging habitats. Like all Manakins, this species takes part in an extravagant lek mating system, which involves a carefully choreographed dance by the males, which the females use to choose a mate. In addition to requiring specific habitats to lek in (size of sapplings, etc.), this species is known to have a mutualistic relationship with plants in the family Melastomaceae(Morales-Betancourt et al. 2012). The goal of this study is to better understand the importance of habitat and behavioral needs of this species by investigating their social organization, movement, and habitat characteristics of their leks and foraging habitat. We characterised lek and foraging habitat, and quantifying use by individuals as well as movements between leks, and between leks and foraging areas. In 2015-2016 we characterised the habitat of 5 active leks and numerous foraging areas at the T.R.E.E.S field site in the Maya Mountains of Belize. In addition to this we have colour banded males (2016; n=10, 2017; n=6) and females (2016: n=12; 2017: n=6). In 2017-2018, we will continue adding colour bands and radio transmitters and will observe leks and feeding territories to quantify movement in this species.

**Individual variation in brain region size in zebra finches: implications for a structural basis of personality**

Kathryn Chenard, University of Arizona; Renée A. Duckworth, University of Arizona

Behaviors are often considered highly flexible traits and assumed to not be subject to the same developmental constraints as morphological traits. However, the high stability of personality traits raises the possibility that structural constraints may play a causal role in personality variation. In particular wiring costs and the timing of development of different regions of the brain may lead to patterns of investment where components that are either located close together or develop at the same time covary more closely than components that are far apart or develop at different times. Here we measured the size of sub regions of the brains of adult and embryonic Zebra Finches to determine whether individuals vary in patterns in investment between these areas consistent with either wiring costs or developmental timing. We found that there is substantial individual variation in the size of brain components and evidence for both wiring costs and a role of developmental timing. Areas that are closer together covaried more than areas farther apart, but only for regions in the front of the brain. Because the front of the brain contains the latest developing cortical regions that are often most costly, our results suggest that an interaction between wiring costs and developmental timing may account for individual variation in brain morphology. This study lays the foundation for future work that will connect variation in brain morphology to differences among individuals in personality.

**A UCE perspective on the phylogeny of the albatrosses, petrels, and shearwaters (Procellariiformes)**

R. Terry Chesser, USGS/NMNH; Andreanna J. Welch, Durham University, Helen F. James, Smithsonian Institution; Vincent Bretagnolle, CNRS

The Procellariiformesare by far the largest group of oceanic birds, but no multi-locus phylogeny of the order is available. We are using genomic sequence capture of UCEs to study evolutionary relationships of all extant and recently extinct Procellariiformes, at and below the species level. As a first step, we analyzed sequences of a representative sample of species to construct a well-supported backbone phylogeny showing relationships among families and other major groups of Procellariiformes. Our family-level results indicated that the albatrosses (Diomedeidae) are sister to the rest of the order, that the storm-petrels (Hydrobatidae) consist of two groups that are not sister taxa, and that the shearwaters and petrels (Procellariidae) are paraphyletic with respect to the diving-petrels (Pelecanoididae).Other results of interest concerned the large family Procellariidae, and indicated that the fulmarine petrels are sister to the rest of the Procellariidae, that the *Puffinus* shearwaters are paraphyletic with respect to *Calonectris* if *Ardenna* is not recognized, and that the Kerguelen Petrel *Aphrodroma brevirostris* is sister to but distantly related to the *Pterodroma* petrels. Nearly all nodes on the tree received 100% bootstrap support.

**Migratory return rates and breeding fidelity in Eastern Bluebirds (*Sialia sialis)***

Derek Coss, University of Maryland Baltimore County; Evangeline M. Shank, University of Maryland Baltimore County; Michael G. Rowley, University of Maryland Baltimore County; Joselyn T. Tesleu, University of Maryland Baltimore County; Kevin E. Omland, University of Maryland Baltimore County

Many migratory birds have low rates of return to their previous nesting locations and mates. These low rates are likely due to the high mortality during migration, making it impossible for re-pairing to occur. We monitored 25 pairs of Eastern Bluebirds (*Sialia sialis*) across 3 breeding seasons to determine their return and re-pairing rates. The Birds of North America (BNA) report a range of return rates from 26% in Minnesota to 70% in South Carolina. Eastern Bluebirds are partial migrants, and we suspect the populations in Maryland are short distance migrants. Previous studies of return rates of Eastern Bluebirds have primarily focused on either long distance migrants or permanent residents. Therefore, few studies have focused on the return rates of short distance migrants. The study of migration in short distance migrants is interesting because variation in migration has large effects on the evolution of breeding systems and mate choice. Our preliminary data suggest that Eastern Bluebirds in Maryland have high return and re-pairing rates. Many of the bluebirds that mated together in previous breeding seasons appear to not only re-pair the next year but also return to the same territory and nesting cavity.

**Colony-specific genetic markers for the assessment of hunting impacts on thick-billed (*Uria lomvia*) and common (*Uria aalge*) murres**

Brody Crosby, Queen's University; Anna Tigano, Cornell University; Gregory J Robertson, Environment and Climate Change Canada; Vicki L Friesen, Queen's University

Thick-billed and common murres (*Uria lomvia* and *U. aalge*) are numerous, pelagic birds that have a circumpolar distribution and represent an integral component of temperate and arctic ocean trophic networks. Murres face a number of anthropogenic threats, including gillnet mortality, marine pollution, and climate-induced changes to marine food webs. An additional pressure is a legal winter hunt of approximately 100,000 murres annually off the coasts of Newfoundland and Labrador. Murres wintering in Newfoundland and Labrador migrate from stable colonies in eastern Canada, from declining colonies in Greenland, and possibly from declining colonies in Europe, however the impact of the hunt on individual breeding colonies is not known. To assess this impact, we are using genomic methods to assign murres hunted in Newfoundland to colonies of origin. Restriction-site associated DNA sequencing (RADseq) and *F*ST outlier analyses allow us to develop colony-specific markers based on samples from 300 thick-billed murres and 200 common murres from 20 colonies across the Atlantic breeding range. Samples from 160 hunted murres are being genotyped for colony assignment, and preliminary genotyping has successfully assigned hunted individuals to species and regions of origin. The results of our project will be important for the management of murres in Canada and abroad. If declining colonies are facing undue hunting pressure, changes in harvest regulations can be considered. In future years, these colony-specific genetic markers may be used to monitor and detect changes in colony composition in the murre hunt and inform development of genetic markers for other species of concern.

**Parasitic eggshell’s pigment concentrations do not match host levels in egg color mimetic Striped Cuckoos**

Miri Dainson, Hunter College and the Graduate Center; Melissa Mark, Landscape Conservation Initiative, Northern Arizona University; Mande Holford, Hunter College and the Graduate Center; Mark E. Hauber, Hunter College and the Graduate Center, City University of New York

The rejection of foreign eggs is the major line of defense in most host-parasite systems, and brood parasitic birds in many lineages have evolved host-mimetic egg coloration to circumvent egg recognition. What is the mechanism of egg color mimicry at the chemical level? Obligate parasitic Common Cuckoos *Cuculus canorus* in at least three host-races have evolved egg color mimicry by depositing similar levels of egg pigments into their shells as do hosts. Here we report on the physical and chemical basis of egg color mimicry in an independent and poorly studied host-parasite system, the Striped Cuckoos *Tapera naevia* and their hosts, the Rufous-and-White Wrens *Thryophilus rufalbu*s. We found that even though parasite eggs are spectrally similar to hosts, and contain the same major blue eggshell pigment, biliverdin, the concentration of this pigment in Striped Cuckoo eggs was similar to some of its non-parasitic New World Cuckoo relatives, and different from the host. Perceptual mimicry of host-parasite eggshell appearance, therefore, need not always be paralleled at the structural and chemical level in birds.

**Geographic variation in Woodhouse’s Scrub-Jay**

Devon DeRaad, Moore Laboratory of Zoology, Occidental College; Amanda J. Zellmer; Biology Department, Occidental College; Whitney Tsai, Moore Laboratory of Zoology, Occidental College; James M. Maley Moore Laboratory of Zoology, Occidental College; John E. McCormack, Moore Laboratory of Zoology

Understanding phenotypic, genetic, and niche differences between different populations of organisms is fundamental to understanding the biodiversity of our planet. We investigated phenotypic variation across the species’ range of Woodhouse’s Scrub-Jays (*Aphelocoma woodhouseii*). There are currently seven described subspecies in this complex spanning from northeast California to southern Mexico. We quantified exact phenotypic differences by character scoring, and measuring body size and plumage reflectance for over 100 individuals from Mexico. Our results showed that individuals from southern Mexico (Sumichrast’s group) were significantly divergent over morphological multivariate space, compared with individuals of the nearest subspecies (*A. w. grisea* and *A. w. cyanotis*) in northern Mexico. Compared with their northern Mexico counterparts, the Sumichrast’*s* group individuals were generally larger in size, and displayed all brown backs, with reduced or absent blue necklaces. After establishing morphological divergence between Sumichrast’s group and the rest of the Woodhouse’s Scrub-Jay complex, we focused on the putative zone of contact between *A. w. cyanotis* and *A. w. sumichrasti* in central Mexico, just east of Mexico City. Morphological analyses indicate that while hybridization may occur within this narrow contact zone, it is likely very rare. Ecological niche divergence may explain the narrow contact zone, but further surveys of exact habitat occupation of each subspecies near Mexico City are warranted. Future projects should focus on the hybrid zone between *A. w. cyanotis*, and *A. w. sumichrasti*, investigating possible pre-zygotic barriers between the subspecies such as divergence in niche, call, or behavior.

**Using MaxEnt to predict the distribution of the West Indian Whistling Duck with presence only records in Caño Tiburones, Puerto Rico**

Sheylda Diaz Mendez, Universidad del Turabo

The West Indian Whistling Duck (*Dendrocygna arborea*) is a vulnerable species in Caño Tiburones, Puerto Rico. Using a spatially balanced, probabilistic approach, I used presence records reported in eBird and ranked them by probability of WIWD occurrence. My hypothesis states that vegetation density is key in their habitat selection process and additional covariates include landcover, temperature, precipitation and distance to disturbance. Analyzed by MaxEnt and visualized using Geographic Information Systems the result is a distribution model that predicts habitat selection. I would like to discuss preliminary results and possible networking to produce a similar map for the distribution of WIWD throughout the Caribbean.

**Eastern Bluebirds do not avoid nest cavities with mouse odors**

Cameron Dove, Davidson College; Elise Lankiewicz, Davidson College; Mark Stanback, Davidson College

For decades, songbirds were assumed to have a poor sense of smell. However, recent research has demonstrated that some songbirds in fact have an excellent olfactory sense. To test whether Eastern Bluebirds (*Sialia sialis*) use olfactory cues to avoid dangerous nest cavities, we presented bluebirds with paired boxes, one of which contained urine-soaked bedding from a mouse cage (the other box contained clean cage bedding). We ran the experiment during the summers of 2016 and 2017 (we focused on summer nesting because adjacent boxes tend to fill with chickadees and nuthatches in the spring). In both years the mouse bedding was added to boxes after the fledging of the first brood. We flipped a coin to determine which treatment the spring box received. We found no effect of either mouse urine or the location of the spring nest on summer box choice.

**Altmetrics – what are they good for?**

Steve Dudley, British Ornithologists' Union (BOU); Tom Finch, RSPB Centre for Conservation Science; Nina O'hanson, Environmental Research Institute, University of Highlands and Islands

The speed at which altmetrics have become established is striking. They are a metric for our instant, digital age. Young researchers in particular have grown up in an ‘instant society’ and expect to see immediate impact of their research on publication. Citations can’t deliver this, but altmetrics can. Altmetrics complement traditional metrics by quantifying the online ‘attention’ of an article across various media. The scoring of these platforms is weighted depending on audience, with news media scoring the highest and social media the lowest. More researchers are taking up social media enabling them not only to promote their own research, but also to extend their research networks. Altmetrics alllow them to track their own performance and that of others talking about their research. Such connections can lead to increased research collaborations. Altmetrics are also being increasingly used by funders to measure the impact of the research they fund. Institutes understand this, and also see that altmetrics measure the attention of the work being undertaken within their walls. With this increased attention on altmetrics, here we explore two main questions: 1. Can altmetrics identify individual scoring sources which authors can influence in order to drive the attention of their own research articles? 2. Can altmetrics contribute to the citation rate of a research article? In order to answer these questions, we analysed over 6,500 research articles published in 10 ornithology journals, breaking down their altmetric scoring sources and comparing individual papers’ Altmetric Attention Scores to their citations rates.

**What's in a feather? Reconstructing mercury concentrations through time using museum specimens**

Sarah Dzielski, Cornell University; Cornelia W. Twining, Cornell University; N. Roxanna Razavi, Cornell University, Finger Lakes Institute, Hobart and William Smith Colleges; Vanya G. Rohwer, Cornell University, Cornell Museum of Vertebrates

Mercury (Hg) released into the environment from anthropogenic sources has become increasingly problematic in ecosystems worldwide. From the late 1860s until the early 1980s, global anthropogenic Hg emissions increased exponentially due to coal emissions, industrial practices and artisanal gold mining. In this study we examined how methylmercury (MeHg) concentrations vary through time in birds within New York State. We focused on the time period 1880 - 2016 to capture variation in biologically available MeHg, corresponding to peak industrial activity and environmental legislation restricting Hg emissions. We examined MeHg concentrations in the feathers of six species that have distinct habitat and dietary preferences: Belted Kingfisher (*Megacerlye alcyon*), Cooper’s Hawk (*Accipiter cooperi*), Eastern Phoebe (*Sayornis phoebe*), Wood Duck (*Aix sponsa*), Ruffed Grouse (*Bonasa umbellus*), and Virginia Rail (*Ralluslimicola*). We used carbon and nitrogen stable isotopes to account for possible changes in habitat and trophic levels between species through time. Our results show predicted patterns in isotopic niches and MeHg concentrations for these species. Species feeding at higher trophic levels (e.g., Cooper’s Hawk) and in aquatic habitats (e.g., Belted Kingfisher) tend to have higher MeHg concentrations than species that are mostly herbivorous or land dwelling (e.g., Ruffed Grouse). Patterns of changes in avian MeHg concentrations through time are more complex, suggesting that the effects of anthropogenic Hg emissions may be highly localized and species-specific.

**Modelling habitat loss in Piping Plovers using an environmental agent-based model**

Brandon Edwards, University of Guelph; Daniel Gillis, University of Guelph

The Piping Plover (*Charadrius melodus*) is an endangered species of shorebird residing in North America. Anthropogenic activities and development in the Great Lakes region has played a direct role in the decrease of habitat for the Piping Plover. Using a novel approach to agent-based models wherein we treat the environment as agents, we aim to efficiently model the habitat loss in this species by simulating the effects of anthropogenic activities and development, the conservation efforts that have taken place over the years, and natural predation against the species. The development of the model will allow us to make a number recommendations based on varying degrees of anthropogenic activity to assist in the restoration of the piper plover population.

**Time is of the essence: optimizing when sampling soundscapes for monitoring avian communities**

Jonathan Eiseman, Western Michigan University; Maarten J. Vonhof, Western Michigan University; Sharon A. Gill, Western Michigan University

Ecologists are exploring the acoustic resource, or soundscape, in response to the need for more accurate and replicable monitoring assessments in habitats that are managed to support biological diversity. Acoustic monitoring provides a means to assess the acoustic diversity of sites or habitats, and may reveal whether management or restoration practices benefit bird communities. Given that generating enormous libraries of soundscape recordings is possible with limited expenditure of resources, but remains challenging to manage and analyze, we need to understand how to optimize sampling regimes without compromising the accuracy of diversity measurements. Thus, we collected soundscapes over an uninterrupted 24-hour period at three grassland and two forest habitats within a nature preserve in Kalamazoo County, Michigan to explore the effects of sampling regimes on calculations of acoustic diversity. We first characterized the diurnal patterns of the soundscape and avian communities using acoustic indices designed to describe the biodiversity of a site. To assess if acoustic patterns diverged under data-restricted regimes, we calculated indices each minute over the 24-hour period and compared results to simulated recording schedules that sampled less frequently. We test whether decreasing the total time analyzed affects our ability to accurately characterize the variation in acoustic diversity, and if different recording schedules exclude information vital to understanding the diversity of avian communities present at the preserve. Preliminary results show acoustic diversity indices exhibit minor differences between full and more sparse recording schedules, suggesting restricted recording schedules can be used to calculate acoustic diversity in bird communities.

**Habitat associations of coastal wetland birds in the Great Lakes basin**

Lisa Elliot, University of Minnesota; Annie Bracey, University of Minnesota; Gerald Niemi, University of Minnesota, Natural Resources Research Institute; Douglas Johnson, US Geological Survey

A basic understanding of regionally-specific habitat associations for individual species is a prerequisite for identifying the causal mechanisms behind regional population trends. Therefore, we are developing models of habitat association for nine declining obligate wetland bird species that use coastal wetland habitat in the Great Lakes basin, using six years (2011-2016) of data from the Great Lakes Coastal Wetland Monitoring Program. Our early preliminary results indicate that Pied-billed Grebe (*Podilymbus podiceps*) occurrence is negatively associated with forest cover in the surrounding landscape and positively associated with emergent wetland cover. American Bittern (*Botaurus lentiginosus*) occurrence is correlated with amount of inland open water. Least Bittern (*Ixobrychus exilis*) occurrence is positively correlated with the amount of grassland/pasture in the surrounding landscape, and number of surrounding wetland patches. Virginia Rail (*Rallus limicola*) occurrence is correlated with number of wetland patches and interspersion/juxtaposition. Sora (*Porzana carolina*) occurrence is negatively correlated with amount of inland water and surrounding cropland. Common Gallinule (*Gallinula galeata*) occurrence is positively correlated with the amount of inland water. Forster’s Tern (*Sterna forsteri*) showed significantly positive correlations with amount of inland water and amount of Great Lakes open water. Black Tern (*Chlidonias niger*) and American Coot (*Fulica americana*) occurrences were not significantly correlated with any of the covariates we have assessed to date. With information about species-specific habitat associations within the Great Lakes region, it will be possible to provide a basin-wide predictive model of the distribution of obligate coastal wetland birds to priority areas for coastal wetland protection.

**Tracking the effects of a neonicotinoid insecticide on migratory birds**

Margaret Eng, University of Saskatchewan; Bridget J. Stutchbury, York University; Christy Morrissey, University of Saskatchewan

Recent decades have seen a dramatic increase in the application of neonicotinoid insecticides, which are now the most widely used insecticides worldwide. Birds that travel long distances between their wintering and breeding grounds may be particularly susceptible to the neurotoxic effects of neonicotinoids. However, the influence of neonicotinoids on the ability of birds to successfully migrate is poorly understood. We assessed the impact of imidacloprid (IMI; a neonicotinoid commonly used in seed treatments) on the migratory behavior of seed-eating passerines during their spring migration. In 2016, we used captive orientation funnel trials to measure migratory orientation and activity of White-crowned Sparrows (*Zonotrichia leucophrys*) caught at stopover sites, and found that birds exposed to environmentally relevant concentrations of IMI reduced food consumption, experienced significant mass loss, and stopped orienting correctly in behavioural trials, whereas control birds maintained body mass and a seasonally appropriate northward orientation. In 2017 we conducted a field study in free-living White-crowned Sparrows to corroborate results from captive trials at an ecologically relevant scale. Birds were caught at a stopover sight in southern Ontario and exposed to control, low, or high doses of IMI (equivalent to 1 or 4 treated canola seeds). Following exposure birds were tagged with uniquely coded transmitter tags and released into an array of automated telemetry towers (Motus Wildlife Tracking System) to track their movements at a landscape scale. Using manual and automated telemetry data, we will be able to assess stopover duration, speed of travel between points, and direction of migratory movements.

**The importance of the Los Angeles urban forest for sustaining migratory bird populations**

Sevan Essaian, California State University Los Angeles; Eric M. Wood, California State University Los Angeles

The Los Angeles metropolitan area (LA) is home to one of the most diverse urban forests on the planet with estimates suggesting nearly 600 native and non-native tree species are distributed throughout the region. The large diversity of trees in the urban environment is likely responsible for attracting a diverse assemblage of wintering migratory birds, which are predominantly native species that spend upwards of seven months of the annual cycle in the region foraging on the surface of trees for food items including insects and fruits. While it remains clear that LA is a hotspot for urban biodiversity, it is unknown exactly which factors influence interactions among birds and trees throughout LA. This is important to understand to help improve management of the LA urban forest for sustaining a major component of southern California biodiversity, the wintering bird community. During the winter of 2015 and 2016, we found strong support that native trees were highly preferred as foraging substrates by wintering migratory birds while non-native trees were avoided. We are building on our initial work by continuing to quantify patterns of bird and tree diversity, and describing tree-species preferences by wintering birds across a socioeconomic gradient throughout LA. More specifically, we have the following objectives within our study: (1) determine patterns of bird foraging success on varying tree species, (2) uncover disparities in the diversity of birds and trees along a socioeconomic gradient, and (3) investigate drivers, whether they are socioeconomic or ‘natural’, which may influence patterns of bird and tree diversity throughout the city.

**Using microphone arrays to determine critical habitat and microhabitat of common avian species in steep decline**

Jeffrey Ethier, Memorial University of Newfoundland; David R. Wilson, Memorial University of Newfoundland; William Balsom, Memorial University of Newfoundland

The decline among North American landbirds has significant economic and ecological impacts. While legislation provides a framework for conservation, basic data on distributions and habitat preferences are lacking for many species. Traditional methods used to obtain this information are limited by cost, accuracy, and human resources. In this study, we investigated avian habitat and microhabitat preferences using microphone arrays that are capable of localizing vocalizing birds in three-dimensional space. Our objective was to identify the habitat and microhabitat features associated with two common species in steep decline, the Boreal Chickadee (*Poecile hudsonicus*) and the Cape May Warbler (*Setophaga tigrina*). In total, we deployed 68 eight-channel arrays at random locations in Labrador, Canada during the 2016 avian breeding season. We characterized the general habitat inside each array, and recorded a suite of weather variables at 20-minute intervals throughout each array’s 24-hour recording period. In total, we detected 2.7 million vocalizations from 41 species. Boreal Chickadees were detected and localized at 47 arrays, while Cape May Warblers were detected and localized at 10 arrays. We are currently returning to those array locations and characterizing the microhabitat at the exact locations where Boreal Chickadees and Cape May Warblers were detected. We are also characterizing the microhabitat at a matching set of randomly determined control locations. Statistical analyses are ongoing, but will identify the habitat and microhabitat preferences of these two species in steep decline, which, in turn, will help to inform conservation strategies.

**A spatially explicit model for estimating risks of pesticide exposure to bird populations**

Matthew Etterson, USEPA Office of Research and Development; Nathan Schumaker, USEPA Office of Research and Development; Kristina Garber, USEPA Office of Pesticide Programs; Steven Lennartz, USEPA Office of Pesticide Programs; Andrew Kanarek, USEPA Office of Pesticide Programs; Jennifer Connoly, USEPA Office of Pesticide Programs

Pesticides are used widely in US agriculture and may affect non-target organisms, including birds. Some pesticide classes (e.g., acetylcholinesterase inhibitors) are known or suspected to cause direct mortality to birds, while others (e.g., synthetic pyrethroids, neonicotinoids) may have sublethal impacts. We developed an integrated modeling workflow to conduct spatially explicit population level risk assessment for birds in agroecosystems that may be exposed to pesticides. The integrated workflow includes three existing USEPA models, the Terrestrial Investigation Model (TIM), the Markov Chain Nest Productivity Model (MCnest), and the HexSim modeling environment. The integrated model is parameterized using data required for pesticides under the Federal Insecticide Fungicide Rodenticide Act (FIFRA), together with species life history data available in the scientific literature. We demonstrate the model by simulating potential pesticide effects on the federally threatened California Gnatcatcher (Polioptila californica), within the U.S. portion of the species range. We simulated impacts from two insecticides, malathion (organophosphate), and ?-cyhalothrin (pyrethroid), applied to wheat crops in a manner consistent with registered labels for the two pesticides. We show declines in gnatcatcher abundance and changes in the distribution of the species following applications of each pesticide, though the model does not predict extinction (within 50 years). The integrated TIM/MCnest/HexSim model is intended to allow risk assessors to evaluate spatial and temporal dynamics that are essential to understanding population persistence in complex spatial landscapes with multiple stressors

**Does anthropogenic noise disrupt parental care in house wrens?**

Niana Faison, Western Michigan University; Eric Branch❖, Western Michigan University; Erin E. Grabarczyk, Western Michigan University; Maarten J. Vonhof, Western Michigan University; Sharon A. Gill, Western Michigan University

Accumulating evidence finds that anthropogenic noise decreases breeding success in birds. The mechanism by which this effect occurs is poorly understood, but noise could disrupt foraging by adults and thereby provisioning of young at nests, leading to lower reproductive success. We tested whether anthropogenic noise affects parental care in House Wrens (*Troglodytes aedon*) during provisioning of their nestlings. We compared provisioning rates of parents when exposed to playbacks of pink noise near nest boxes to control periods without noise playback. Pink noise has more energy in lower than higher frequencies, making it similar in structure to traffic noise but more consistent. We observed parental behaviors during 1 hr playback trials and determined the number of visits, the duration of time inside and outside boxes, and prey loading during control and noise treatments. Preliminary analyses found that house wren parents made fewer provisioning trips to feed nestlings, but they spent more time per visit both inside and outside of nest boxes during noise playbacks than control periods. Parents always brought only a single prey item, indicating no effect of treatment on prey loading. These early results suggest that noise disrupts provisioning but increases parental attendance at boxes. We speculate that increased attendance occurs under elevated noise because noise may distract parents and make it harder to detect predators, which in turn affects provisioning patterns. If so, parents may spend more time scanning their environment and may spend less time feeding their offspring under noisy conditions, contributing to lower success.

**Influence of energetic condition and Vitamin E on West Nile Virus resistance of American Robins**

Kimberly Fake, Michigan State University; Jennifer C. Owen, Michigan State University

The environment plays a role in modulating host-pathogen interactions and ultimately the spread of infectious disease. West Nile Virus (WNV), a reemerging pathogen of global importance, is maintained in nature in wild birds. The magnitude and duration of virus circulating in the bird’s blood directly impacts their ability to transmit the virus to a biting mosquito vector, which has consequences for disease dynamics. Environmental stressors, such as unavailability of food and specific nutrients, can influence a bird’s response to this pathogen. Using the American robin (*Turdus migratorius*), an important avian reservoir for WNV, we will test how food limitation and vitamin E levels alter constitutive immunity and viral resistance. Wild-caught hatch-year robins will be held in captivity and divided into three different diet treatment groups, to achieve birds in (1) normal condition, (2) poor condition, and (3) normal condition with vitamin E supplementation. Following the diet treatment, all birds will be experimentally infected with WNV. Blood samples will be collected for titers of WNV and WNV-specific antibodies on 0-6 and 8-14 days post infection, respectively. Blood samples will also be collected at critical time points to assess constitutive measures of immune function, including white blood cell counts, natural antibody activity, complement activity, and plasma haptoglobin. We will also test the birds’ plasma antioxidant capacity, oxidative damage, and plasma vitamin E concentration. Understanding how environmental variations influence a reservoir host’s response to a pathogen, will lead to further understanding of epizootics that pose significant risk to humans, domestic animals, and wildlife.

**Anthropocene’s effect on habitat choice in early successional species: a preliminary study on the American Woodcock in northern New Jersey**

Kathleen E. Farley, Rutgers-Newark; Claus Holzapfel, Rutgers-Newark

Highly populated areas face the complementary effects of habitat loss and degradation leading to the potential for animals to select inferior habitat. Habitat selection tenets (e.g. Ideal Free Distribution) assume animals are well-informed regarding habitat quality before they establish territory. However, for migratory animals this assumption is unlikely to be upheld. In regions of industrial sprawl, animals are faced with identifying quality territory where former cues may no longer provide useful information. Post-industrial sites (old rail yards, landfills, former industrial complexes, superfund sites etc.) visually appear similar to early successional habitat, but these altered habitats may contain pollutants, altered hydrological regimes, delayed succession, and modified floral and fauna communities. These landscapes can exist as significant sources of available habitat within a region and may lead to a shift in habitat usage where animals equally or preferentially select post-industrial sites over non-industrial sites. To test this, during spring 2016 I monitored the activity of American Woodcock (*Scolopax minor*), an indicator species for the early successional faunal community, to determine to what extent they use post-industrial habitat. We conducted crepuscular courtship surveys from mid-March through early May across ~30 sites in northern New Jersey that were categorized as either post-industrial or non-industrial. Presence of woodcock, including numbers of actively displaying males, and frequency of courtship flights were determined across the region. Preliminary results suggest the woodcock do not discern differences between post-industrial and non-industrial habitat for courtship displays.

**Building a Northeastern wildlife tracking network – The Northeast Motus Collaboration**

Alison Fetterman, Willistown Conservation Trust; Lisa Kiziuk, Willistown Conservation Trust; David Brinker, Project Owlnet; Scott Weidensaul, Project Owlnet and The Ned Smith Center for Nature and Art; Todd Alleger, Willistown Conservation Trust

After more than a century of research, our understanding of the movement ecology of migratory birds and other animals is still surprisingly rudimentary. Yet understanding how animals move across the landscape is critical to conserving them in a rapidly changing world. A new generation of miniaturized VHF radio telemetry technology, coupled with a rapidly expanding network of automated receiver stations through the Motus Wildlife Tracking System (Motus), has the ability to bring greater precision and efficiency to the study of migratory species such as birds, bats, and large insects. However, the greatest limitation to the current Motus array is its coastal nature. In 2016 we formed the Northeastern Motus Collaboration (NMC) to establish a network of wildlife tracking radio receivers across Pennsylvania and the interior northeastern United States, which will expand upon the current array of towers and increase researchers’ ability to monitor interior flyways during migration. Over the next three years, the NMC aims to complete three phases of tower construction: 1) Install a line of 18 towers across Pennsylvania from Philadelphia to Lake Erie by September 2017; 2) Expand the statewide Pennsylvania network to approximately 40 towers by the end of 2018; and 3) In 2019, establish 30 or more towers northward in New York and New England, creating a more diffuse network across the northeast inland region. Once a minimum threshold of stations has been achieved, we will deploy VHF nanotags on nesting and migrant Northern Saw-whet Owls (*Aegolius acadicus*) at Project Owlnet cooperator stations in New England and eastern Canada, allowing us to track their movement in real time across continental scales. Expanding the Motus network to cover the mid-Atlantic and northeast will fill a critical geographic gap and will dramatically increase our ability to understand migration and habitat use by hundreds of species of migrants.

**A comparison of occupancy estimates produced by morning versus evening point counts**

Melanie Florkowski, University of Michigan; Neil Gilbert, University of Alabama

It is well known that birds sing most frequently and are most detectable at dawn. Point counts, therefore, have been almost universally conducted in a four-hour window after sunrise. In this study, we investigate whether evening point counts can produce estimates of occupancy probability comparable to morning counts. Previous research suggests that avian density estimates vary by time of day. However, estimates of occupancy probability from morning versus evening data have not been compared. If evening point counts produce estimates comparable to morning point counts, ornithologists would be able to maximize survey time during the brief breeding season. We hypothesize that, while results will be species-specific, the estimates of occupancy probability will not be notably different for most species. In Summer 2017, we will conduct multi-species, fixed-radius point counts in both morning and evening hours in an agricultural mosaic in Alabama, USA. We will use a hierarchical occupancy model analyzed in a Bayesian framework to estimate occupancy probability using multiple candidate models incorporating different combinations of land-use/land-cover covariates and select the top models. We will first analyze the morning data and then use the selected models to estimate occupancy probability using the evening data. We will present the results by comparing the estimates for occupancy and detection probabilities generated by the morning and evening data. In addition to our hypothesized results, we recommend that researchers conduct pilot fieldwork to determine the variation in detectability of focal species by time of day prior to departing from standard morning point counts.

**Determining Impacts on Least Tern Breeding Colonies Along a Gradient of Human Disturbance**

Brittany Fournet, The University of Charleston; Paul Nolan, The Citadel

Populations of seabirds and shorebirds are in steep decline including populations of the beach-nesting least tern (*Sternula antillarum*), which has decreased in number across its range. This study examines the impacts of human disturbance as a possible cause of the decrease. Human disturbance was measured at ten colonies in southwest Florida by observing flushing of terns from their nests in response to different degrees and types of disturbance. We recorded all disturbance events during our observation periods, as well as the distance of any disturbance from the colony. The colonies were divided into 15 m sections to compare impacts of disturbance on core versus peripheral parts of the colony. Different categories of disturbance included human, dog, crow, gull, other, and unknown. The different categories of disturbance events were significantly different in terms of percent of colony flushed and time spent away from the nest, with dogs and crows causing the largest response. There was no significant difference in our measure of response for the core versus peripheral parts of the colony, nor was there a significant correlation between the degree of disturbance and nesting success. Crow disturbances were typically at sites where trash was common on the beach. Our results suggest keeping dogs and crows away from the beach would reduce flushing of the least terns.

**Comparison of Arrival Dates of Rail Migration in the Southwest Lake Erie Marshes, Ohio, USA**

Auriel Fournier, Mississippi State University; M.C. Shieldcastle, Black Swamp Bird Observatory; T. Kashmer, Black Swamp Bird Observatory; K.A. Mylecraine, New Jersey Audubon

Several studies have documented the arrival time of spring migration of Virginia Rails (*Rallus limicola*), King Rails (*R. elegans*), and Soras (*Porzana carolina*) on the southwestern shore of Lake Erie, though not in recent decades, and most of this information is based on anecdotal records. These three species were captured in wetlands on Ottawa National Wildlife Refuge in Ottawa and Lucas Counties, Ohio, USA, from 2004 to 2009. Virginia Rails and Soras were documented arriving in northern Ohio earlier than previous research, but not older anecdotal records. King Rails were within the bounds of all previous records. Using traps with playback may have allowed us to detect these species at earlier dates than previous research. Documenting current spring migration arrival timing of these three secretive marsh bird species is important for future monitoring, research and wetland management.

**Loggerhead Shrike Occupancy in South Carolina**

Jennifer Froehly, Clemson University; Amy Tegeler, South Carolina Department of Natural Resources; Beth Ross, U.S. Geological Survey South Carolina Cooperative Fish and Wildlife Research Unit, Clemson University; Catherine M.B. Jacho

The Breeding Bird Survey (BBS) and Christmas Bird Count (CBC) indicate steep declines in the Loggerhead Shrike (*Lanius ludovicianus*) population for over thirty years. The BBS and CBC also indicate that the most severe decline in Loggerhead Shrikes occur in the southeastern United States. Because of these trends, Loggerhead Shrike is a species of highest priority on the South Carolina State Wildlife Action Plan of 2015, but few dedicated studies of the species have been conducted in this region. Our objective is to start to fill this data void by conducting surveys in the coastal plain of South Carolina using a passive point count and playback methodology, and to examine how land use may affect Loggerhead Shrike occupancy. In spring 2016 and 2017, we surveyed 96 roadside points adjacent to cropland or pasture habitats. We detected shrikes at 12 points through passive point counts, while 4 more patches were detected occupied when adding playback data, for a total of 16 occupied patches. We will use occupancy modeling to test biologically plausible hypotheses relating land use distribution factors at multiple spatial scales to Loggerhead Shrike occupancy. Preliminary results indicate an estimated detection rate of 0.523 ± 0.156 and an occurrence rate of 0.14 ± 0.10, with occupancy being most influenced by percent forest at a 1km scale and aggregation of pasture at a 15km scale. We will project our top predictive occupancy model to the coastal plain of South Carolina to help guide future management and monitoring strategies for this species.

**Social integration of irruptive Black-capped Chickadees into Carolina Chickadee territory**

Rebecca Garlinger, Villanova University Biology Department; Christine Eldredge, Villanova University; Chris Roche, Villanova University; Robert Curry, Villanova University

Animal social behavior is often characterized by intricate and dynamic social interactions between individuals. Social network theory states that we can analyze dyadic interactions within a community to understand group-level social structures. Social network analysis (SNA) is a method that allows us to examine and quantitatively compare a wide range of social behaviors using network theory. We employed SNA using radio frequency identification (RFID) technology at feeders to examine social behavior in an overwintering population of resident Carolina Chickadees (*Poecile carolinensis*) and irruptive Black-capped Chickadees (*P. atricapillus*). From November 2012 through February 2013, Carolinas (N = 82) and Black-capped Chickadees (N = 14) formed seven SNA “communities” that were consistent with winter flocks in size (~ 13.7 birds per group) and home range. Communities demonstrated an average of 17,880.2 ± 6,125.06 visitations, with 1,820 ± 192.7 visits per bird across the site. Each of the seven communities had a preference for a different feeder location, yet 84% of all groups overlapped at feeders with at least one other visiting community. Pair-wise associations across all communities did not depend on species similarity (r = 0.015, p = 0.334), and both Black-capped and Carolina Chickadees showed similar numbers of associations. Resident Carolinas had stronger and more stable relationships (p < 0.001) than Black-capped Chickadees and were more central and influential in the network. Our data suggest that resident Carolina Chickadees may not form discrete flocks, but instead form flock-like communities that allow for integration of irruptive birds.

**Genomic Evidence for Aquatic Adaptation in the Common Loon (*Gavia immer*)**

Zach Gayk, University of Windsor; Alec R. Lindsay, Northern Michigan University

Comparative genomics has become a viable method for studying the adaptation of species to their environment at the genome level. We investigated this in Common Loons (*Gavia immer*) by finding signatures of positive selection as evidence for genomic adaptation. We used Illumina short read sequencing data from a female common loon to produce a fragmented assembly of the Common Loon (*Gavia immer*) genome. The assembly had a contig N50 of 814 bp, and a total length of 767,326,331 bp. We identified fragments of 13,821 common loon genes and another 348 coding sequences of unknown function, for a total of 14,169 common loon genes. Based on estimates from well-resolved avian genomes, this figure represents 80.7% of common loon genes. We calculated dN/dS ratios between Common Loon and Adelie Penguin, (*Pygoscelis adeliae*), Red-throated Loon (*Gavia stellata*), Chicken (*Gallus gallus*), Northern Fulmar (*Fulmarus glacialis*), and Rock Pigeon (*Columba livia*) for a high confidence set of 5,760 orthologous gene fragments to find genes under positive selection. We found 164 positively selected genes in the common loon that were enriched for a number of protein classes, including those involved in muscle tissue development, immunoglobulin function, hemoglobin iron binding, G-protein receptors, and ATP metabolism. The signature of positive selection in these areas suggests common loons may have adapted for underwater diving by (1) compensations of the cardiovascular system and oxygen respiration, (2) low-light visual acuity, (3) elevated solute exchange, and improved metabolism.

**Exploring patterns and drivers of acoustic diversity during the dawn chorus**

Sharon Gill, Western Michigan University; Nate Fuller, Southwest Michigan Land Conservancy; Kathleen M. Baker, Western Michigan University; Maarten J. Vonhof, Western Michigan University

The accelerating pace of conversion of natural landscapes to human-dominated ecosystems requires us to consider new ways to explore and understand diversity in natural areas. One approach is to study soundscapes, which are the collective sounds of environments; that is, sounds generated by animals, geophysical processes such as wind and rain, and humans and their activities. We recorded soundscapes of forest and grassland sites around sunrise at nine nature preserves over the summer to assess whether acoustic diversity, generated primarily by the dawn song of birds, varies over time and between habitat types within and across preserves. From recordings, we calculated the Acoustic Complexity Index (ACI), which has been shown to be a robust indicator of avian acoustic diversity. Analysis completed thus far incorporating date, time, habitat type and site finds that ACI was higher in grassland than forest habitats and changed over the season in both, but in different ways. ACI peaked after sunrise in grassland, but showed only a slight steady increase from 1 hour before to 3 hours after sunrise in forests. Generalized additive models including significant effects of date, time, and habitat, explained about 20% of the variation in ACI. Thus, our preliminary results suggest that acoustic diversity during the dawn chorus varied over time and space. We will present final results incorporating land-use, anthropogenic noise and weather in addition to those variables already considered to more fully understand patterns and drivers of acoustic diversity during the dawn chorus.

**How the egg rolls: the geometry of avian egg movements.**

Ian Hays, Hunter College, City University of New York; Iva Ljubicic, Graduate Center of the City University of New York; Mark E. Hauber, Graduate Center of the City University of New York, University of Illinois, Urbana-Champaign

The significance of the avian egg’s form for movement and spatial stability are understudied, despite its relevance to successful reproduction. A handful of prior studies focused on how pyriform eggs of the Uria genus of Murres roll in a small tight circle, a putative cliff-breeding adaptation, resulting from a dominant conical element of the shell’s profile. These studies are problematic, however: they lack clear definitions of morphological characteristics/experimental variables; are limited to pyriform egg typologies; and have conflicting results. The aim of our study was to clarify the relationship between egg morphological traits and its movement/displacement, while ensuring validity to a broader swath of avian taxa. We identified and defined three distinct variables: width/length (W/L), the apical width distance from the blunt end of the egg/length (AWD/L), and how dominant a conical element is on the eggs profile (conicality). To study how eggs move, 3d printed models with single-variable modulations of form that incrementally deviate from a sphere were released onto a planar surface, at various inclinations. Digital motion tracking all egg-rolls (n=450) showed the most conical egg model having significantly lower maximum displacement (p<0.001) at the highest incline, than all other models. Decreasing a model’s w/l value increased displacement, while lowering awd/l decreased displacement. Initial rolling results (n=270) from 9 multi-variable egg models (modulating W/L and conicality simultaneously) showed that proportionally longer eggs might roll farther than shorter eggs with an identical level of conicality. Though Uria eggs are highly conical, their extreme low w/l ratio is not ideal for displacement suppression, suggesting alternate/additional selection pressures for the evolution of its unique shape.

**Effectiveness of CHD1 sex-linked chromosome primers in sexing Snowy Plovers on the southern Great Plains**

Kristen Heath, Texas Tech University; Warren C Conway, Texas Tech University; David A Ray, Texas Tech University; Neal Platt, Texas Tech University

On the Southern Great Plains (SGP), Snowy Plovers (*Charadrius nivosus nivosus*) are thought to be facultatively polygynous and/or monogamous. This theory has not yet been validated for these isolated midcontinental populations, and discrepancies in their assumed sexual dimorphism have been observed (females identified in the field have been molecularly revealed to be males). To better understand this phenomenon, we used DNA fragment analysis to determine the sex of 277 adult and nestling Snowy Plovers captured from 2008-2016, and collected high-resolution photographs of captured adults to examine plumage variability. We evaluated the use of two different primer combinations (P2/P8 and M5/P8) for the CHD1 sex-linked gene, using fluorescently-labeled primers to enhance PCR gel-electrophoresis and fragment analysis resolution. Amiplicons > 300 bp, as with P2/P8, have been discovered to lose amplification efficiency. However, we found that M5/P8 primers, which reduce amplicon size by 130 bp and therefore increase amplification efficiency, to be a consistent and productive primer combination when sexing Snowy Plovers on the SGP. This supports other work in non-Charadriiforms that indicate the M5/P8 primer combination may be a more reliable, and consistent primer set for molecular sexing Snowy Plovers.

**Effects of anthropogenic light and noise on the vocal behaviour and spatial ecology of birds**

Bronwen Hennigar, Memorial University of Newfoundland; David Wilson, Memorial University of Newfoundland

Anthropogenic disturbance, such as noise and light, can influence avian behaviours. For example, several observational studies have shown that the presence of noise and light from highways, airports, and cities is correlated with changes in song production, predator-prey interactions, and foraging behaviour. Yet, understanding the effects of these disturbances is challenging because multiple forms of disturbance often co-occur. For example, the noise produced by highway traffic is usually confounded by the presence of streetlights, headlights, and a highway. Furthermore, the fine-scaled spatial relationships between birds and disturbance is often difficult to observe, which further obfuscates our understanding of how birds react to disturbance. Our objectives are to: (1) test for a causal relationship between anthropogenic disturbance and the singing behaviour and spatial ecology of birds, and (2) to determine whether the possible effects of light and noise are redundant, additive, or synergistic. In this study, we manipulated anthropogenic light and noise using a 2-factor playback experiment, which resulted in four possible treatment combinations (no light or noise; light without noise; noise without light; light and noise). Treatments were broadcast throughout the night from inside microphone arrays that are capable of localizing vocalizing animals in 3-dimensional space. In total, we conducted 68 trials at random locations in Labrador, Canada. In each trial, we recorded and localized vocalizations produced before, during, and after the manipulations. Analyses are on-going, but should show the independent and combined effects of anthropogenic light and noise on the vocal behaviour and fine-scale spatial movements of birds.

**Phylogeography of a widespread seabird (*Ardenna pacifica*) using genome-wide markers**

Rachael Herman, University of Michigan; Donna Dittmann, Louisiana State University; Michael Harvey, University of Michigan

Pelagic seabirds are highly mobile, reducing opportunities for population isolation in allopatry that might promote differentiation and speciation. At the same time, many species are philopatric, and their tendency to return to their natal islands to breed may reduce gene flow sufficiently to permit local adaptation and differentiation. However, few well-sampled studies of geographic patterns of genetic differentiation have been possible in seabirds, primarily due to a shortage of fresh genetic samples from their remote breeding locations. Museum specimens can provide a ready source of DNA from otherwise un-sampled regions and sequence capture methods can be used to recover data from many genomic loci even in degraded museum specimens. We studied the phylogeography of a widespread seabird, the Wedge-tailed Shearwater (*Ardenna pacifica*), using a sequence capture approach. We sampled A. pacifica from throughout its distribution, using a combination of tissue samples and toepads from museum specimens. Using sequence capture and Illumina sequencing, we obtained data from thousands of genomic loci across samples, including museum skins. We found that *A. pacifica* showed significant genetic structure between major ocean basins, evidence that populations have differentiated despite the mobility and potential connectivity among them. We also found differences among populations in effective population size, and evidence of historical migration among populations. Our results highlight the potential of sequence capture methods for genetic studies in species for which recent samples are widely unavailable.

**The correlation among microsatellites, genome size, metabolic rate, and body mass in birds**

Yanzhu Ji, Field Museum of Natural History; J. Andrew DeWoody, Purdue University; Shannon J. Hackett, Field Museum of Natural History

Microsatellites are hypervariable tandem repeats in eukaryotic genomes which often serve as neutral or nearly-neutral genetic markers. Compared to other taxa, bird genomes are relatively small with conserved karyotypes and low transposon activity. Given these attributes of bird genomes, we hypothesized that the content of microsatellites would be positively correlated with avian genome size. Since avian genome size is intercorrelated with body mass and metabolic rate, we therefore expected the content of microsatellites to be correlated with body mass and metabolic rate as well. Using over 60 published bird genomes and Tandem Repeat Finder, we examined the content of microsatellites from whole-genome assemblies. We correlated the length, number, and mean allele size of microsatellites with genome size, body mass, and metabolic rate. Microsatellites were not correlated with genome size. However, we found mean allele size of microsatellites to be positively correlated with metabolic rates and negatively correlated with body mass. We conclude with a discussion of biological and technical factors to help explain these observations.

**Phylogeography of the Green-throated Mountain-gem (*Lampornis viridipallens*)**

Rosa A. Jiménez, University of California, Berkeley, Universidad de San Carlos de Guatemala; Zachary R. Hanna, University of California, Berkeley; María Fernanda Asturias, Universidad de San Carlos de Guatemala; Rauri C.K. Bowie, University of California, Berkeley

Nuclear Central America (NCA), located between the Isthmus of Tehuantepec (IT) and the Nicaraguan Depression (ND), possesses a complex topography and climatic history. Volcanic mountain ranges originated in the region through the tectonic processes of transformation and subduction and were greatly impacted by the Pleistocene climatic cycles. The IT and ND are dry, lowland valleys that montane species are unable to cross. These natural barriers have contributed to allopatric divergence of animal and plant lineages. However, the effect of the internal topography of NCA on lineages of montane avian species has not been well-explored as the majority of studies have included few samples from this region. In order to examine whether phylogeographic breaks exist across montane habitats within this region, we collected samples of *Lampornis viridipallens*, an endemic hummingbird species restricted to mountain cloud forests. We visited seventeen sites across the major mountain ranges in western NCA (Chiapas, Mexico and Guatemala). Genetic analyses indicated that, while there is evidence of gene flow, there are major geographic features, such as the Motagua-Polochic-Jocotan series of faults, that represent barriers to movement among mountain ranges. Our analyses also revealed high genetic diversity within two mountain ranges, the Sierra de Chamá and the Sierra Madre Volcanic Range. We found that montane cloud forest habitats in NCA act as islands in a lowland matrix to isolate populations of *L. viridipallens*, which suggests that the intricate topography within NCA has been an important driver of the diversification of the resident montane avifauna.

**A vagrant Kingbird in Ohio represents the first known Western x Couch's Kingbird (*Tyrannus verticalis* x *T. couchii*)**

Andrew W. Jones, Cleveland Museum of Natural History; Courtney L. Brennan, Cleveland Museum of Natural History; Kenn Kaufman, Black Swamp Bird Observatory; H. Thomas Bartlett, Cleveland Museum of Natural History

In December 2015, a Yellow-bellied Kingbird (genus *Tyrannus*) was discovered on Kelleys Island in the western basin of Lake Erie (Erie Co., Ohio, USA) by Tom and Paula Bartlett. Western Kingbirds (*T. verticalis*) are fairly routine vagrants to eastern North America in fall, and this individual was initially reported as that species. Additional field observation suggested that coloration and structure were inconsistent with a pure Western Kingbird. The outer tail feathers had white margins, typically diagnostic in this genus for Western Kingbird, but the white was reduced in extent. The bill size and shape, tail shape, breast coloration, and other details differed from Western Kingbird and suggested that one parent was either a Tropical Kingbird (*T. melancholicus*) or Couch’s Kingbird (*T. couchii*). The bird responded to playback of Couch's Kingbird vocalizations, but not to those of Western nor Tropical Kingbirds. In-hand examination showed that this individual was an after second-year male. The bird was banded, and we obtained feathers for DNA analysis. We amplified and sequenced the mitochondrial ND2 gene and the nuclear myoglobin intron 2 of this individual as well as several congeners. The mitochondrial data were similar to a known Couch's Kingbird. The nuclear gene had four heterozygous loci and confirmed that the other parent was a Western Kingbird. This is the first documented hybrid between these two species.

**Ecological correlates of behavioural and social change in dichromatic Papuan Fairywrens**

John A. Jones, Tulane University; Jordan Boersma, Washington State University; Erik Enbody, Tulane University; Jordan Karubian, Tulane University

Ecological variation within a close geographic proximity may play a substantial role in shaping local behavioural phenotypes. Australo-Papuan Fairywrens (Maluridae: *Malurus*) exhibit substantial variation in habitat preference, morphological phenotype, and sociality. Our research focuses on the degree to which ecological variation (here, natural and anthropogenic habitat structure changes due to forested areas and burning of grass) influences movement, home range extent, and sociality in a dichromatic population of the White-shouldered Fairywren (*M. alboscapulatus lorentzi*). This species is notable because males are qualitatively similar in appearance across multiple subspecies throughout New Guinea, whereas female plumage variation ranges from fully dichromatic to nearly monochromatic. Our previous research with two subspecies of White-shouldered Fairywrens has revealed substantial differences in land use, body size, aggression, and overall sociality. From July-Oct 2016 and Mar-June 2017, we investigated how variation in habitat structure and patchiness of available habitat influences movement and social behaviors within dichromatic White-shouldered Fairywrens. We quantified social change relative to variation in habitat structure before and after large (human-induced) burns throughout our field site, using burns as a proxy for habitat fragmentation. We found that overall sociality decreased in areas that are highly fragmented whereas continuous grasslands remained highly social. However, after previously scorched areas of our field site had recovered, sociality appeared to increase, representative of that of continuous grassland areas. These findings are consistent with the idea that habitat structure and fragmentation across New Guinea may have played a role in shaping phenotypic divergence of White-shouldered Fairywrens.

**Changes in song repertoire length and song elements use in response to different levels of anthropogenic noise**

Roselvy Juárez, Universidad de Costa Rica; Gilbert Barrantes, Universidad de Costa Rica; Luis Sandoval, Universidad de Costa Rica

Anthropogenic noise in urban habitats affects negatively the acoustic communication of birds, because it could mask vocalizations that birds use to communicate with other individuals. To understand how individual birds overcome the effect of noise is a key part of understanding their communication in urban habitats. Therefore, our main goals were: (1) to compare differences in richness and abundance of elements on House Wren song repertoire between populations exposed to different noise levels, and (2) to evaluate in the elements shared between populations how the frequency and time characteristics vary in relation to noise. We recorded 28 males of House Wren during two consecutives breeding seasons, at four locations exposed to different noise levels. We recorded each male on two days each breeding season for one hour per day, and simultaneously measured noise level with a sound level meter. We classified song elements based on the appearance in the spectrogram and frequency characteristics. We measured minimum and maximum frequency, frequency of maximum amplitude, and duration in each element. House Wrens inhabiting less noisy locations had larger repertoires than individuals inhabiting noisy locations. This may indicate that some elements do not transmit well in noisy environments, and therefore are not produced. Shared elements between populations showed higher minimum frequency in noisy sites, probably to avoid being masked by noise. These results provide evidence of adaptations that birds inhabiting urban environments implement to communicate acoustically.

**Methods matter: a better way characterize the diets of insectivorous birds using fecal DNA**

Michelle A. Jusino, USFS; James Skelton, University of Florida; Mark T. Banik, USFS; Jonathan M. Palmer, USFS; Lori Blanc, Virginia Tech; Steven Good, Virginia Tech

Next-generation sequencing (NGS) offers a powerful and non-intrusive tool to characterize avian diets. However, methodological decisions and data processing have a major impact on the results obtained from NGS techniques. More informed methodologies lead to more accurate assessments and more robust conclusions. We used template DNA from a diverse set of arthropods to assess PCR biases of several CO1 primer pairs used to assess dietary information from insectivore feces. To validate our diversity estimation in mixed DNA samples, we developed a “mock diet”, consisting of single-copy plasmid DNA from a taxonomically diverse set of over 40 arthropod taxa, to serve as a spike-in control. The mock diet was also used as a reference to inform our bioinformatics pipeline. The most frequently used primer pair for NGS insectivore diet studies (ZBJ) had a narrow taxonomic range, and favored detection of certain arthropod taxa. In PCR tests, a novel primer pair (ANML) recovered 98% of arthropod taxa, whereas ZBJ recovered 40%. We then used ANML primers to perform NGS on fecal samples collected from 7 adult Red-cockaded Woodpeckers (*Picoides borealis*; RCWs) at Eglin Air Force Base during fall and winter 2016. We recovered 40,000 sequences, and identified 22 arthropod taxa, including many that RCWs were not known to consume. Unexpected taxa included several known and potential forest pests. Previous studies that visually examined RCW stomach lavages suggested that RCWs are ant specialists. Ants were notably missing from our NGS data, suggesting that their importance to RCWs may vary across time or populations.

**Development and analysis of avian index of biological integrity for Kentucky wetlands**

Kaitlyn Kelly, Eastern Kentucky University; David Brown, Eastern Kentucky University

Bird communities are frequently used as bioindicators to assess environmental conditions, including in wetland habitats. We developed an avian index of biological integrity (IBI) for wetlands of Kentucky as an intensive assessment method to supplement an existing rapid assessment method used in regulatory programs. Birds are useful indicators because they are sensitive to environmental changes, abundant in various landscapes, occupy higher trophic levels, and can be sampled in a cost-effective manner. Breeding bird point count data from 140 sites were used to calculate a set of metrics, including avian community measures and guilds based on relative abundance. Metrics were tested for correlation with an independent measure of wetland condition based on landscape and site stressors. High performing, non-repetitive metrics were tested in various combinations to find avian community metrics that best predicts wetland condition. Final metrics were scaled and assembled into an IBI. We found four superior metrics to be correlated with the independent disturbance index. Insectivorous and foliage-gleaning guilds had higher relative abundance at higher condition wetlands, while omnivorous and ground-gleaning guild percentages had higher relative abundance at lower condition wetlands. Guilds represented in these metrics included more species than other metrics tested, creating a greater degree of variation within the guild to correlate to the disturbance index. Previous studies in other regions found similar results with insectivorous and foliage-gleaning guilds being intolerant to human disturbance, whereas omnivorous and ground-gleaning guilds tend to be more tolerant. This cost-effective and time-efficient IBI complements existing assessment tools for wetlands of Kentucky.

**Nested subset patterns of avian assemblages in wetlands**

Libby Keyes, Governors State University; Rick Baisa, Governors State University; John Yunger, Governors State University

Nested subset patterns are used to describe nonrandom distributions of species in isolated habitats and require that species found in smaller, less diverse locations are also found in more species-rich assemblages. These distributions can be heavily influenced by a variety of biotic and abiotic factors, particularly habitat fragmentation that occurs as a result of urbanization and human disturbance. The size of the areas following human disturbance is a key factor in driving distribution patterns. Consequently, nested models lend themselves to the conservation and management of preserves, including the determination of their size and distribution. The distribution and abundance of breeding wetland birds in northeastern Illinois was surveyed during the summers of 2015 and 2016. These data were analyzed using Monte Carlo simulations, whose results indicated that the birds exhibited statistically significant non-random distribution patterns. Generally, the number of species became more diverse as habitat area increased and species found in small sites were also found in larger sites. Our results strongly suggest that wetland birds are area-sensitive species whose management strategy should focus on a few large preserves as opposed to numerous small preserves when available land is limited. Comparison to results from a similar study conducted in 1998 show no significant change in nested subset patterns despite altered levels of human disturbance, suggesting that the distribution of wetland birds appears to be stable over time.

**Michigan’s ugly duckling: quantifying color morphs in Mute Swan cygnets**

Randall Knapik, Michigan State University; David Luukkonen, Michigan Department of Natural Resources; Scott Winterstein, Michigan State University

Mute Swans (*Cygnus olor*) are large waterbirds native to Eurasia whose cygnets exhibit gray (dominant) and white color morphs controlled by a single sex-linked gene. Color morph prevalence varies in their native range (80 – 99% gray) as a result of selective breeding for white morph individuals. Human-assisted movement to North America has resulted large feral populations; however, the genetic composition of founding individuals is unknown. As a result, the color morph ratio of mute swans in Michigan’s population is unknown. Previous research in their introduced range has shown differences in survival and age-at-first nesting between the color morphs which could influence management strategies. A partnership was established between Michigan State University, the Michigan Department of Natural Resources, and the U.S. Department of Agriculture’s Wildlife Services to inform management strategies of the invasive mute swan. The number of cygnets of each color morph was determined at hatch for nests within five 36 km2 study sites in Michigan. Forty-three percent of hatched cygnets had gray initial plumage, but the proportion of gray cygnets varied between sites (0 – 78%). A subset of fledged gray (n = 9) and white (n = 13) morph cygnets were fitted with neck collar-mounted GPS-GSM transmitters to estimate survival and movement. Survival (0.604 ± 0.16; 1 October – 31 March) was slightly lower than in other areas of their native and introduced range and no GPS-marked cygnets nested at 1 year of age. Results from this research are being used to refine population management strategies in Michigan.

**Visible migration counts of the Common Nighthawk (*Chordeiles minor*) on the north shore of Lake Superior**

Stephen Kolbe, University of Minnesota-Duluth; Annie Bracey, University of Minnesota-Duluth; Gerald Niemi, University of Minnesota-Duluth; Matthew Etterson, U.S. Environmental Protection Agency

With average annual counts of over 20,000 individuals, the fall migration of Common Nighthawks (*Chordeiles minor*) along the north shore of Lake Superior is the largest known concentration of this species in the world. Visible migration counts of nighthawks were conducted for three weeks each year from 2008-2016 in Duluth, Minnesota. This daily evening count has elucidated the weather variables that most often lead to large flights: light winds, westerly winds, and warm temperatures, conditions not often associated with autumn migration. While the geographic origin of these migrants is unknown, many come from the Canadian boreal forest, where this species has undergone a significant decline and is listed as threatened. Due to the low density and crepuscular nature of this species, survey methods such as the Breeding Bird Survey or the National Nightjar Survey are ineffective for population assessments. The annual fall count on Lake Superior is likely the best and most cost-effective way to census Common Nighthawks breeding in the boreal forest and to determine population trends for this declining aerial insectivore.

**Urbanization alters fear behavior in Black-capped Chickadees**

Zachary Kruyf, Calvin College; Jenna L. Atma, Calvin College; Hattie N. LaCroix, Calvin College; Jenna L. Van Donselaar, Calvin College; Darren S. Proppe, Calvin College

Our landscapes are becoming increasingly urban. Urbanization provides many benefits for humans, but it dramatically alters the habitats utilized by animals. Urban habitats also contain many novel stimuli, some which represent threats and others which are harmless. As such, urban adapted songbirds must learn quickly which threats require a fearful response. In cases where experience is correlated with a cost, fear should increase. Conversely, fear due to novelty should decrease when negative outcomes do not follow the stimulus. Black-capped Chickadees (*Poecile atricapillus*) are an excellent model to compare fear behavior because they thrive in both urban and rural habitats. We conducted a series of feeder and playback experiments to explore whether urbanization altered Black-capped Chickadee’s fear responses to model cats, humans, a novel object, anthropogenic noise, and willingness to cross forest openings. We predicted that neophobic responses to cat models would increase in urban birds because interactions with cats are more common, but decrease compared to rural birds for all other stimuli because there is not an immediate fitness cost. Fear of cats increased with urbanization and fear of noise decreased, as indicated by willingness to visit a feeding station. However, other stimuli were not associated with urbanization, which may be related to the use of parks rather than more secluded locations. These plastic behavioral responses to novel stimuli may facilitate the urban success of the black-capped chickadees and may be an important indicator of whether a species can thrive in the urban environment.

**Some factors associated with egg hatching in Tree Swallows**

Michael Lombardo, Grand Valley State University; Brianna Wilson, Grand Valley State University; Nicole Keck, Grand Valley State University; Stacy Keydel, Grand Valley State University

Egg hatching success is critical to the reproductive performance of birds. We tracked the hatching success of 7,095 individually-marked eggs laid in 1,387 Tree Swallow nests in nest boxes in west Michigan from 1992-2016. The year an egg was laid, the date it was laid, its mass, and the total number of eggs in its clutch were associated with its hatching success if it was laid by a second-year female, but not if it was laid by an after-second-year female. In second-year female nests, eggs that hatched weighed more than those that did not. The mass of eggs laid by after-second-year females was not associated with their hatching success. Eggs 1-3 were as likely to hatch as were eggs 4-6 in second-year female nests. In contrast, eggs 4-6 were more likely to hatch than were eggs 1-3 or egg 7 in after-second-year female nests. Overall, an egg’s position in the clutch was not associated with its probability of hatching in the most common clutch sizes of 4-6 eggs. Whether all the eggs in a clutch hatched or not was associated with the number of eggs in the clutch and the age class of the female that laid them. Generally, complete clutches were more likely to hatch if the eggs were laid by after-second-year females. Collectively, these results suggest that depending on female age class different factors were associated with egg hatching success in Tree Swallows.

**Habitat associations and abundance of birds in the Black Hills and Bear Lodge Mountains of South Dakota and Wyoming**

Elizabeth Matseur, University of Missouri; Frank R. Thompson III, USDA Forest Service Northern Research Station; Joshua J. Millspaugh, University of Montana; Brian E. Dickerson, USDA Forest Service Rocky Mountain Research Station; Mark A. Rumble, USDA Forest Service Rocky Mountain Research Station

Human activity and natural disturbances, such as wildfire and mountain pine beetle (*Dentroctonus ponderosae*) infestation, have recently altered forest structure in the Black Hills. More information on relationships between avian abundance and forest structure and disturbance is needed. Our objective was to determine densities of American Three-toed Woodpecker (*Picoides dorsalis*), Black-backed Woodpecker (*Picoides arcticus*), Brown Creeper (*Certhia americana*), Red-breasted Nuthatch (*Sitta canadensis*), and White-winged Junco (*Junco hyemalis aikeni*) in relation to vegetation characteristics and disturbance at the point- and landscape-level in the Black Hills and Bear Lodge Mountains of South Dakota and Wyoming. We conducted 3,696 and 3,414, 5-minute point count surveys, from late-March to late-June in 2015 and 2016, respectively, across a gradient of forest structure and disturbance types. We estimated densities using three-level hierarchical time-removal models. Black-backed Woodpeckers and Brown Creepers were positively related to recent wildfires; however, Red-breasted Nuthatches were negatively related to percent area in 3- to 5-year-old wildfires. With the exception of American Three-toed Woodpeckers, species were positively related to percent cover of beetle killed trees. Brown Creepers, White-winged Juncos, and Red-breasted Nuthatches had mixed responses to percent overstory canopy cover. White-winged Juncos also had a positive association with percent ground vegetation, whereas, Brown Creepers were strongly linked with white spruce (*Picea glauca*) vegetation type. Maintaining some areas of natural disturbances along with heterogeneity of vegetation characteristics within stands and at the landscape-scale will benefit the diverse needs of birds in the Black Hills.

**Synchronization and frequency features of highly overlapped duets change according to the context**

Carolina Mendez, Universidad de Costa Rica; Luis Sandoval, Universidad de Costa Rica

Territorial defense and mate guarding are two main hypotheses of duets functions. Nevertheless, acoustic characteristics of duets under both functions have rarely been quantified in detail. The aim of this work was to analyze changes in the spectrotemporal characteristics and synchronization in White-eared Ground-sparrow duets produced in both contexts: territory defense and mate guarding. If contexts affect spectrotemporal characteristics and synchronization, we expected to observe differences when compare duets of the same pair in each context. We conducted the study in 35 color banded ground-sparrows pairs in Costa Rica. We recorded pair duets produced spontaneously when members of the pair came into contact, to analyze duet features under mate guarding context. We recorded duets produced in response to simulate intrusions using acoustic playbacks, to analyze duet features under territory defense contexts. We measured minimum and maximum frequency, the frequency of maximum amplitude, and duration of duets. We measured synchronization comparing time and frequency variation in three sections of duets (i.e., start, middle, and final section) of duets produced under both contexts. Duets in territory defense contexts showed lower minimum frequencies and higher synchronization than mate guarding contexts. Our results suggest that White-eared Ground-sparrows encode context-depend information by changing frequency characteristics and synchronization of duets. In conclusion, decrease the minimum frequency and increase the synchronization of duets produce a most aggressive, and probably most effective, duets in territorial defense, given that low-frequency sounds are associated with hostile contexts.

**Influence of environmental gradients on the relationship between taxonomic and functional diversity in grassland birds**

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Ecologists often use biodiversity to prioritize conservation and management decisions. Because numerous definitions of biodiversity are used in ecological research, each cataloging a different aspect of diversity or measuring systems at different levels of biological organization, it is difficult to generalize findings. As various definitions of biodiversity might lead us to prioritize conservation of different areas, we propose a framework for evaluating biodiversity metrics that are directly comparable, evaluate the fundamental relationships between commonly used diversity metrics, and investigate why these fundamental relationships might become disjointed spatially. Biodiversity metrics that are functionally unrelated should not be used interchangeably without caution, whereas metrics that are stably correlated across landscape gradients might safely be interchanged in studies of diversity. Here we examine the relationship between species richness and functional group richness in bird communities across the state of Nebraska, covering a wide land use gradient. We surveyed the avian community during the breeding season using point counts and used species occurrence to quantify species richness and functional richness in nesting, foraging, and diet guilds. We use multivariate models to examine the relationship between two common metrics of biodiversity, species and functional group richness, and demonstrate how the relationship is influenced by a land use gradient. Our results will be useful to conservation biologists and wildlife managers interested in targeting areas that maximize both species and functional group richness in this declining guild of birds.

**A multi-scale approach to detecting the response of migratory land birds to changes in habitat availability**

Frank Moore, University of Southern Mississippi; Theodore J. Zenzal**,** University of Southern Mississippi

Each autumn, the northern coast of the Gulf of Mexico provides habitat for birds migrating from temperate breeding locations to tropical wintering grounds. The availability of these stopover habitats is constantly changing in response to natural and anthropogenic impacts. For example, coastal counties of Mississippi and Alabama have gained urban development and lost forested habitats. Loss of stopover habitat, especially close to migration barriers (oceans, deserts), likely increases migrant density in remaining habitats and increases competition for limited food resources. Our objective is to use a multi-scale approach to determine the response of migratory birds to changes in stopover habitat availability within Alabama (Baldwin and Mobile counties) and Mississippi (Jackson County). Our approach involves: 1) Using weather surveillance radar over a broad extent to relate changes in autumn migrant stopover distributions with changes in land use over the last 20 years. We expect migrant densities to decrease in areas that experienced urbanization or deforestation, while migrant densities should increase in areas reforested. 2) Using bird banding data from 1995 – 2014 collected at the Bon Secour National Wildlife Refuge in Fort Morgan, AL, to determine if local migrant abundance matches regional patterns of migrant density. These two complementary, long-term datasets provide a unique perspective on the reliance of land bird migrants on coastal habitats.

**Disentangling the evolutionary history and functionality of avian assemblages in a city of the Chihuahuan Desert**

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Urban habitats differ in their disturbance regimes, which act as an environmental filter determining plant community species composition. Although urban avian assemblages have been thoroughly studied, there is considerably less knowledge about the evolutionary history and functionality of bird assemblages in desert ecoregions. In this study, we quantified two biodiversity metrics (phylogenetic and functional) in avian communities from Ciudad Juárez, a city located in the Chihuahuan Desert ecoregion. We sampled the three major habitat types present in Ciudad Juárez: urban green areas (parks, golf courses), agricultural fields, and desert scrub, between July 2012 to August 2015. We also used spatial and non-spatial regressions to test for relationships between phylogenetic and functional and predictor variables describing current climate, elevation, human population density, human impact, habitat heterogeneity, and log-transformed introduced alien bird richness.

**Variation in tail spot size in Hooded Warblers: sexual dimorphism but no evidence of sexual selection**

Ronald Mumme, Allegheny College; Anne Jacobs, Georgia Southwestern State University; Abby Hileman, Shaver's Creek Environmental Center

Hooded Warblers startle potential insect prey by constantly flicking their tails while foraging, revealing the contrasting white tail spots on the outer rectrices. Tail spot size, however, shows considerable inter-individual variation that is highly repeatable across annual molts and significantly related to both age (ASY > SY) and sex (M > F), even after statistically controlling for variation in tail length. We tested the hypothesis that the sexual dimorphism in tail spot size was a result of sexual selection by means of a field experiment at our study site in NW Pennsylvania. As females were arriving in early May in 2014-15, we captured 24 territorial males and either temporarily reduced the extent of white in their tail (N = 13) or treated them as sham-reduced controls (N = 11). Reduction of tail spot size had no significant effect on pairing success (100% in both groups), date of pairing, first egg date, or mate quality (measured by minimum age of the mate). Although it is possible that male tail spot size may affect extra-pair mating success, our results suggest that the sexual dimorphism in tail spot size may not be a product of sexual selection. Instead, we suggest that the sexual dimorphism may be related to strong sex differences in preferred habitat on the Caribbean wintering grounds; because males prefer closed-canopy tropical forest and females prefer open scrub habitat, natural selection for optimal foraging performance in different light environments may be responsible for the sex difference in tail spot size.

**Effects of human disturbance level on yolk carotenoid allocation in Carolina Chickadees**

Jennifer Newbrey, Columbus State University; Jaleesa Clarke, Columbus State University; Michael G. Newbrey, Columbus State University

Human disturbance can negatively affect the reproduction of birds, with birds breeding in areas with high levels of disturbance typically experiencing lower reproductive success than those in less disturbed habitats. A novel way to assess the effects of human disturbance on avian reproduction is to measure variation in concentrations of yolk carotenoids (i.e., biologically active, yellow, orange, and red pigments) from birds breeding in habitats of varying levels of disturbance. We studied variation in yolk carotenoid concentrations, egg metrics, female morphological characteristics, and measures of reproductive success of Carolina Chickadees (*Poecile carolinensis*) breeding at four sites with varying levels of human disturbance in west-central Georgia, USA. Carotenoids had never previously been studied in Carolina Chickadee eggs, so we first identified the yolk carotenoids for the species. We found four yellow dietary carotenoids in the egg yolks of Carolina Chickadees: beta-carotene, beta-cryptoxanthin, lutein, and zeaxanthin. We found significant differences in concentrations of total carotenoids and beta-carotene across sites, with chickadees breeding at the site with the lowest level of human disturbance having the highest concentrations of carotenoids. Surprisingly, chickadees that bred at Columbus State University, a high disturbance site, also had high yolk concentrations, suggesting that other habitat features also influenced carotenoid allocation. No significant differences were found in egg metrics, female morphological characteristics, or measures of reproductive success across sites. Future research will focus on direct quantification of human disturbance at the study sites to better understand the role that disturbance plays in affecting carotenoid allocation and chickadee reproduction.

**Investigating the genomic consequences of a precipitously declining Florida-scrub Jay population**

Tram Nguyen, Cornell University; John W. Fitzpatrick, Cornell Lab of Ornithology; Andrew G. Clark, Cornell University

Understanding the genetic consequences of population decline is an ongoing challenge in evolutionary biology, ecology and conservation. Describing the relationship between genetics and shrinking population sizes is more important than ever as global change, habitat loss, and fragmentation threaten more and more species. The prevailing conservation genetics paradigm predicts that shrinking populations are increasingly subject to genetic drift and stochastic processes that reduce genetic variation, which in turn, can cause inbreeding depression, reduced resistance to disease, and increased susceptibility to environmental stochasticity. Models abound about the impacts of population decline, but empirical evidence remains scarce, especially in natural populations over long time periods due to the shortage of genomic resources. With the advent of next-generation sequencing, it is now possible to obtain precise measurements of both neutral and functional genetic variation in order to trace genetic responses to population decline. We leverage genome-wide single-nucleotide polymorphism (SNP) and demographic data to assess changes in genetic diversity, level of inbreeding, and degree of relatedness within and between two Florida scrub-Jay (*Aphelocoma coerulescens*) populations of varying sizes and trajectories over an 8 year period to investigate fundamental ecological and evolutionary questions about the genomics of population decline in the wild.

**Dynamic color in a black-and-white world: Penguin beak spots as biosentinels in the Antarctic**

Paul Nolan, The Citadel; Brogin Van Skoik, The Citadel; Tom Hard, University of Oxford

Animals’ external characteristics, including behaviors, sexually-selected ornaments, and integumentary colors, reveal details of their age, physiology, and/or body condition. Ornamental coloration of the beak and feet, in particular, signal health status that can vary dynamically on a time frame of minutes or hours. Gentoo penguins (*Pygoscelis papua*) display a deep red beak spot, with substantial variation between individuals shown experimentally to reflect concentration of carotenoid pigments. Carotenoid pigments may be used in mating displays or in the immune system, meaning that birds showing the deepest red are in the best condition. We sampled 50+ birds at each of 10 breeding colonies on the Antarctic peninsula, taking care not to sample the same bird twice. Using a color standard placed next to the bird in each photo, we standardized light levels of the photos before measuring hue, saturation, and brightness. We calculated colony-wide mean values along each of those parameters, and found substantial variation between the colonies. We compare those means with other publicly-available data to assess possible causes of the variation, considering prey availability, tourism visits, latitude, and ambient temperature changes as possible correlates. Our work will not only allow better management of human activities such as tourism and fishing in the Antarctic, it may help us predict future changes on the Antarctic peninsula.

**Environmental heterogeneity and metabolic flexibility in Horned Larks and House Sparrows**

Paige Oboikovitz, University of South Dakota; David Swanson, University of South Dakota

Bird species vary in their physiological and behavioral capacities to cope with changing environmental temperatures. Summit metabolism (Msum = maximum cold-induced metabolic rate) may vary geographically and temporally within and among bird species, with species living in colder environments generally having greater metabolic capacities. Seasonal adjustments of metabolic capacities also occur in birds, with elevated capacities in winter than in summer for species wintering in cold climates. Behavioral selection of favorable microclimates can moderate seasonal exposure to temperature variation, but opportunities for such microclimate selection may vary among birds, depending on their habitat. In this study, we compared seasonal minimum (basal metabolic rate, BMR) and maximum (Msum) metabolic rates of Horned Larks (*Eremophila alpestris*) and House Sparrows (*Passer domesticus*). Horned Larks occupy open areas, with little protection from weather conditions, whereas House Sparrows occupy more sheltered habitats. We hypothesized that greater seasonal variation in operative temperatures (Te = field climatic conditions) would occur in open field sites occupied by Horned Larks than for the more sheltered sites occupied by House Sparrows and that Horned Larks, consequently, would show greater seasonal flexibility in metabolic rates than House Sparrows. Preliminary data are consistent with these predictions, with open areas showing greater seasonal differences in Te than more sheltered areas and larks showing greater seasonal variation in metabolic capacities than sparrows (Winter Msum/Summer Msum: 53% for Horned Larks, 28% for House Sparrows). These data are congruent with the idea that temperature serves as a primary driver for metabolic variation in birds.

**Breeding habitat of the critically endangered Bahama Oriole: new documentation of extensive breeding in pine forests.**

Kevin Omland, University of Maryland, Baltimore County; Daniel C. Stonko, Bahamas National Trust; Lehron Rolle, Bahamas National Trust; Michael G. Rowley, UMBC; Jennifer L. Christhilf, UMBC; Scott B. Johnson, Bahamas National Trust; Leslie Brace, Bahamas National Trust; Shelley Cant, Bahamas National Trust

The Bahama Oriole (*Icterus northropi*) is a critically endangered species endemic to The Bahamas and currently found only on the Andros island complex. With the elevation of the Bahama Oriole to full-species status in 2011, research suggested that there might be fewer than 300 individuals remaining in the global population. The Bahama Oriole was also termed a “synanthropic species” based on data suggesting that the species nested almost exclusively within anthropogenic residential and agricultural habitats in introduced coconut palms (*Cocos nucifera*). These conclusions were based on population surveys primarily focused on settled areas near the coasts. However, we documented multiple pairs of orioles with breeding territories deep in pine forests, and we present the first records of Bahama Orioles nesting in pine forests – in both a Caribbean Pine tree (*Pinus caribaea*) and native understory thatch palms (*Leucothrinax morrisii*). Given the predominance of the pine forests on Andros, this newly documented breeding habitat has important implications for estimating the population size. Furthermore, native pine forests are clearly among the habitats that need to be considered for the long-term survival of this oriole. We are conducting extensive point counts this field season to better document the density of orioles across the different habitats on the island.

**Variation in fruit consumption by landbirds at a stopover site during fall migration**

Jen Owen, Michigan State University; David Sandhal, Michigan State University; Aya Pickett, Michigan State University; Yushi Oguchi, Michigan State University

Migration is an energetically costly journey that many landbirds make each fall and spring. Their ability to meet the demands of the migratory period rely on their ability to find food and deposit sufficient fat to fuel their flights. In the fall, many landbirds meet their energetic requirements through the consumption of fruits. Fruit-bearing shrubs are widely distributed, but the quality of their fruit varies, including the level of macronutrients and antioxidants, and their overall energy potential for a migrating bird. We collected fecal samples from several frugivorous landbirds, American robin (*Turdus migratorius*), gray catbird (*Dumetella carolinensis*), and Swainson’s thrush (*Catharus ustulatus*), during autumn migration at a stopover site in mid-Michigan. Using mistnets birds were captured from mid-August to mid-October over 4 years (2012-2016). Immediately after extraction birds were placed in boxes with sheets of white paper where they would defecate. The papers were collected and preserved in a freezer until they could be analyzed. Fruit type was then determined by comparing collected samples with samples of known berries in the field, using color, seeds, and sometimes smell. The primary fruits consumed were Common Spicebush, European Buckthorn, Gray Dogwood, and Highbush Cranberry. We observed significant variation in the species of fruit consumed within a season and between years. In years when the spicebush was fruiting, it represented a high proportion of the bird’s diet despite their low stem counts in the habitat. In the intervening years, the consumption of buckthorn was much higher relative to its abundance in the habitat. The energetic potential of the fruit of spicebush exceeds that of the buckthorn. This variation in availability and quality of fruit has consequences for a bird’s ability to put on sufficient fat for their migration south, as well as maintain a healthy immune system during the migratory period.

**Say what? Inter-annual, inter-specific song switching in Golden- and Blue-winged Warblers**

Kyle Pagel, University of Toledo; Gunnar R. Kramer, University of Toledo; Cassandra L. Ziegler, Minnesota Cooperative Fish and Wildlife Research Unit, University of Minnesota; Katelyn Maley, Minnesota Cooperative Fish and Wildlife Research Unit, University of Minnesota; Henry M. Streby, University of Toledo

Golden- and Blue-winged Warblers (*Vermivora chrysoptera* and *V. cyanoptera*, respectively) represent a closely related species complex but likely comprise a single species. Despite minuscule genetic differences, the two species exhibit distinct plumage and song phenotypes. They hybridize regularly where their breeding distributions overlap and although hybrids and individuals with phenotypically pure plumage traits have been observed singing the “wrong” song (i.e., a Golden-winged Warbler singing a Blue-winged Warbler song, or vice versa), we are unaware of any documented cases of individuals switching song types in subsequent years (i.e., a Blue-winged Warbler singing a typical Blue-winged Warbler song during one year and singing a typical Golden-winged Warbler song during a subsequent year). Herein, we describe our observations of inter- and intra-annual song switching by Golden- and Blue-winged Warblers. From 2015-2016, we recorded individually marked, Golden- and Blue-winged Warblers from Pennsylvania, USA (n=1) and Ontario, Canada (n=1) singing the primary song of both species in different years. In 2015, we also recorded a Golden-winged Warbler in Ontario switching between a typical Golden-winged Warbler primary song and a typical Blue-winged Warbler primary song within the same singing bout, and once during a single song. Our findings suggest song type may be more flexible than previously thought. Further research is required to understand the prevalence, context, and drivers of song switching in Vermivora warblers. We hypothesize about potential implications of song switching in evolutionary, behavioral, and population monitoring contexts.

**Long-term retention of clutch desertion by Yellow Warblers in the absence of cowbird parasitism**

Brian Peer, Western Illinois University; Michael Kuehn, University of California Santa Barbara; Stephen Rothstein, University of California Santa Barbara

Adaptive traits are commonly assumed to decline when they no longer provide fitness benefits. However, behavioral adaptations may persist under relaxed selection because their costs may be small. Defenses that hosts exhibit against brood parasitism provide an ideal system for studying trait evolution under relaxed selection because there is a clear relationship between the trait and selection pressure. The Yellow Warbler, *Setophaga petechia*, frequently deserts clutches parasitized by the Brown-headed Cowbird, *Molothrus ater*. We experimentally parasitized warblers in three populations that differed in exposure to cowbirds to test for nest desertion. Warblers exposed to cowbird parasitism in western Montana deserted experimentally parasitized nests significantly more frequently (36.8%) than naïve conspecifics breeding 90 km away in eastern Idaho where cowbirds were very rare (13.0%), to which they were genetically similar. Sympatric warblers may desert clutches more frequently because individuals have had prior exposure to cowbird eggs or the presence of cowbirds indicates a greater probability of parasitism. Warblers isolated from brood parasitism for about 6,300 years in central Alaska, deserted 27.3% of experimentally parasitized nests and this rate did not differ significantly from sympatric or naïve populations. These results suggest that Yellow Warblers in the allopatric population have retained clutch desertion behavior despite their prolonged isolation from cowbirds.

**Possible relationship between vocal communication system and fat reserve in wintering birds: A test of the optimal body mass**

Nuwanthika Perera, Wichita State University; Christopher M. Rogers, Wichita State University

Fat reserve is a key adaptation in wintering small birds that maximizes individual fitness in a variable environment. Optimal body mass models suggest that the winter fat reserve maximizes winter survival by balancing costs and benefits of fat deposition. Costs of a high fat reserve include reduced predator avoidance and increased predator-exposure while feeding. The benefit of high fat reserve is increased survival when resources are scarce. Flocking integration may play an important role in determining the fat reserve of birds. We are testing the hypothesis that if bird species have a high vocal repertoire, then they will have high flocking integration and communication efficiency, which reduces predation risk and allows the species to maintain high fat reserves. This hypothesis was tested by recording the vocalizations of the Dark-eyed Junco and American Tree Sparrow in Kansas. The junco is typically fatter in winter than the tree sparrow and is predicted to have a larger vocal repertoire within its winter flocks. A Marantz digital recorder with a Sennheiser directional microphone was used to record vocalizations at feeding stations. Raven software was used to describe different vocalizations within each species. Tree Sparrows produced one call type per 30 minute observation period whereas juncos produced 2 -4 call types. There was no difference in call rate per bird per minute in two species (t = 1.6178, P = 0.134). These results generally support the hypothesis that greater vocal repertoire allows bird species to maintain higher winter fat reserves.

**Baby birds take flight: ontogeny of intermittent flight in Zebra Finches**

Christine Petersen, University of Montana; Natalie Wright, Kenyon College; Bret Tobalske, University of Montana

Many birds, especially passerines and woodpeckers, use a form of intermittent flight called flap-bounding. Flap-bounding is characterized by a bird holding its wings in a flexed position, tightly against its body between flapping phases during forward powered flight. Birds that bound use this technique at various speeds, potentially to their metabolic and aerodynamic advantage. We sought to describe the development of this skill quantitatively in order to determine when juveniles are able to fly like adults. We closely monitored the flight development of captive-bred Zebra Finches after they fledged, collecting data every 1-2 days. A variable-speed wind tunnel was used to test their abilities at low to high flight speeds. We also tested fledgling abilities flying horizontally in a flight corridor. From this, we collected empirical data on wing-beat frequency, bounding frequency, bound duration, and take-off velocity and acceleration. We found that Zebra Finches begin flap-bounding only a few days after fledging, but develop this flight style slowly. After three weeks out of the nest, the bounds of juvenile Zebra Finches remain distinguishable from those of adults.

**Variation in organ size between migratory and non-migratory birds**

Erin Place, The Ohio State University at Lima; Jacqueline K. Augustine, The Ohio State University at Lima

Migration status has been observed to influence organ size. Previous studies have shown that compared to non-migratory birds, migratory birds have larger heart mass, pectoral muscle mass, gizzard mass, and intestine mass. The purpose of this study was to determine if migratory species had larger heart, pectoral muscle, gizzard, proventriculus:gizzard ratio, intestine, liver, and proventriculus size than non-migratory species. Thirty-one species of birds were salvaged, frozen, thawed and weighed. The heart, proventriculus, gizzard, pectoral muscle, liver, intestines, and cecum were dissected and weighed. We conducted a standard least squares regression test to determine whether organ size, calculated as percent of body mass, varied among long-distance migrants, short-distance migrants, and non-migratory birds. Taxonomic Family was a random effect in the analyses. Only the proventriculus:gizzard ratio varied with migration status, with non-migratory birds having lower values than migratory birds. Therefore, my hypothesis that organ size should be larger in migratory birds was not supported. My results are similar to other studies that found that the proventriculus:gizzard ratio is smaller in non-migratory species than migratory species. Differences between the current study and previous studies may be due to the number of species examined, the types of species examined, or the inclusion of additional covariates such as diet in previous studies.

**An instance of hybridization and parental interaction of Great-tailed and Common Grackle (*Quiscalus*)**

Alexis Powell, Emporia State University; Jack Kirkley, University of Montana Western

The Great-tailed Grackle (*Quiscalus mexicanus*) and Common Grackle (*Q. quiscula*) are phylogenetically distant among grackles and were historically allopatric. Northward range expansion of the Great-tailed Grackle brought these species into contact < 100 years ago, but has not led to any notable interactions. We report a brood of two hybrid offspring of a male Great-tailed and female Common Grackle at the periphery of these species’ ranges, in Dillon, MT, in 2015. Hybrids of Great-tailed Grackle with Boat-tailed Grackle (*Q. major*), Brewer’s Blackbird (*Euphagus cyanocephalus*) and Red-winged Blackbird (*Agelaius phoeniceus*) are known, whereas hybridization of Common Grackle has never been reported. Both parents defended and fed the fledglings at the nest tree, the latter behavior extraordinarily unusual for a male Great-tailed Grackle. After the young left the tree and moved ~2 km across town, the male alone fed them for at least six more weeks. During that time, the young began attaining black secondary coverts as expected for Common Grackle or male Great-tailed Grackle. Analysis of DNA from a feather of one offspring confirmed it was male, had Common Grackle mitochondrial DNA, and had hybrid nuclear DNA. In 2016, the male Great-tail courted a female Common Grackle that was also attended by a male Common Grackle. She produced five young, but all were pure Common Grackles, not hybrids. Notably, another male Great-tailed Grackle in the vicinity was observed feeding a lone nestling in one of the three nests he defended, suggesting that such behavior occurs more frequently than has been appreciated.

**Hormone-Mediated Life-History Tradeoffs Demonstrated in Dark-eyed Juncos**

Susan Reed, Indiana University-Bloomington; Adam Fudickar, Indiana University; Sarah Wanamaker, Washington State University; Ellen Ketterson, Indiana University

Hormones are well-known intermediaries of life-history tradeoffs, suggesting a substantial relationship between hormones and fitness. The results of previous studies suggest that the hormone testosterone can mediate tradeoffs between survival and reproduction. Here, we explore how this tradeoff is expressed in free-living Dark-eyed Juncos (*Junco hyemalis*). Across two breeding seasons, we measured individual male differences in maximum testosterone production using a standardized gonadotropin-releasing hormone (GnRH) challenge protocol. GnRH challenges provide a repeatable measure of an individual male’s ability to produce testosterone. We then compared individual testosterone production to apparent survival and number of offspring (both social and extra-pair offspring), predicting a positive relationship between testosterone and number of offspring, a negative relationship between testosterone and survival, and overall stabilizing selection in which the fitness optimum is represented as the population mean of GnRH-induced testosterone production levels. Analyses to determine how natural selection acts on the ability to produce testosterone are still underway.

**Vocal and genetic variation within a chickadee contact zone in central Illinois**

Shannon Regan, Eastern Illinois University; Eric Bollinger, Eastern Illinois University; Zhiwei Lui, Eastern Illinois University; Fahad Alshammari, Eastern Illinois University

Black-capped and Carolina Chickadees are distributed parapatrically from New Jersey to Kansas, forming narrow hybrid zones in areas of sympatry. Genetic studies in Pennsylvania and Ohio have concluded that these contact zones are slowly moving north, presumably due to climate change. The ranges of these species have been relatively stable based on vocalizations, but within Illinois, long-standing contact zones have never been genetically tested. We will conduct genetic analyses of adults and nestlings from four different sites within and on both sides of the contact zone. We will also be recording and analyzing vocalizations produced by birds within this contact zone to compare with our genetic findings and to results from previous studies. This study will clarify the underlying mechanisms for genetic and vocal variations to aid in further research surrounding the possible disconnect between cultural and genetic findings and also the effects of climate change on bird populations throughout North America.

**Songbird nest success is positively related to vegetation structure and tree thinning in managed pine-oak savanna and woodland in the Ozark Highlands, Missouri**

Melissa Roach, University of Missouri; Frank R. Thompson III, U.S. Department of Agriculture, Forest Service, University of Missouri; Todd Jones-Farrand, Gulf Coastal Plains and Ozarks Landscape Conservation Cooperative

High quality savanna-woodland communities have largely disappeared from the Midwest while many early-successional bird species are simultaneously declining in abundance. Efforts to restore pine savanna and woodland have increased in Missouri within recent years, and understanding breeding bird response to this restoration is important for specific management strategies, such as increasing species richness and abundance, to be effective. We estimated nest survival rates for six songbird species with varying natural histories in relation to temporal, vegetation, and management covariates in restored savanna and woodland in southern Missouri during the 2014 and 2015 breeding seasons. Eastern Towhee (*Pipilo erythrophthalmus*) daily survival rate (DSR) was not related to any temporal, vegetation, or management covariate. Prairie Warbler (*Setophaga discolor*) DSR was related only to nest stage and day of year. Yellow-breasted Chat (*Icteria virens*) DSR was positively related to tree thinning. Eastern Wood-Pewee (*Contopus virens*) and Summer Tanager (*Piranga rubra*) DSR was negatively related to mean canopy cover. Pine Warbler (*Setophaga pinus*) DSR was positively related to sapling density. Additionally, we combined species into shrub- and canopy-nesting guilds. The shrub-nesting guild experienced greater DSR in areas that had been thinned while the canopy-nesting guild had greater DSR in areas with less basal area and less canopy cover, a result of thinning activities. Our results demonstrate positive relationships both directly and indirectly with management treatment and suggest that pine savanna and woodland restoration in Missouri is providing high quality breeding habitat for both early-successional species and woodland generalists.

**What you should know about the ornithology collection at the University of Iowa**

Trina Roberts, University of Iowa; Cindy Opitz, University of Iowa; Cody Crawford, University of Iowa

Research collections at the University of Iowa Museum of Natural History (SUI) are currently emerging from a long period of unintended obscurity and scientific disuse. Intensive efforts by museum staff are now greatly improving curatorial and storage conditions and data visibility for this historic and underutilized collection. We provide an overview of the museum’s major ornithology collections, which include mounted birds and study skins (about 14,000 specimens), eggs and nests (about 17,000 sets or specimens), related data, and documentary materials from expeditions and collectors. Data quality and accessibility for this collection are extremely variable, but are currently better overall for study skins than for eggs and nests. Here, we describe the taxonomic, geographic, and temporal coverage of our research collection, as well as some of its key historic aspects. Taxonomically, our collection includes 25 avian orders and 149 families, with slightly more than 50% of specimens being passerines. More than 50% of the SUI bird specimens were collected before 1901 and more than 85% before 1961. About 82% of our specimens are from North America, with 75% from the United States, 50% from the Midwest, and about 30% from Iowa itself. We also describe some of the current efforts to revitalize this collection, including rehousing, digitization, and data crowdsourcing.

**Using birds as ecological indicators to evaluate the success of riparian restoration via Beaver Dam Analogues (BDAs)**

Sarah Rockwell, Klamath Bird Observatory; Jaime L. Stephens, Klamath Bird Observatory

The North American beaver, once thought to be a pest, is now recognized as a keystone species playing a vital role in maintaining diverse stream and riparian habitats, and improving water retention and groundwater recharge. Beaver dams can expand the size and complexity of wetlands, enhancing habitat for wildlife. Since 2014, beaver dam analogues (BDAs) have been built in the Scott River, CA, and its tributaries in order to mimic these beneficial effects. Birds are considered excellent ecological indicators, and studying the bird community allows us to assess the success of this riparian restoration, and potentially identify habitat components that have not yet been achieved. We are measuring bird abundance and diversity at five BDA sites and one control site in the Scott Valley. Two years of surveys immediately following BDA implementation at each site will provide baseline bird metrics prior to riparian development. We completed 18 standardized 5-min. point count surveys during each of three site visits in spring 2016, and eight 20-min. area search surveys during three site visits in fall 2015 and 2016. Preliminary results include 55 bird species detected during the spring breeding season, and 108 species detected during fall migration, including birds listed as endangered (Willow Flycatcher) and threatened (Bank Swallow) in the state of California. In 2017, we will complete the second year of spring point count surveys. Follow-up surveys will occur five-six years post-restoration. If BDAs are successful at enhancing riparian and wetland vegetation, we expect birds dependent on these habitats to benefit.

**Population genetic characteristics of Seaside Sparrows (*Ammodramus maritimus*) in Texas**

Mckenzie Roeder, Austin Peay State University; Christopher E. Hill, Coastal Carolina University; Sabrina Taylor, Louisiana State University; Stefan Woltmann, Austin Peay State University

Seaside Sparrows (*Ammodramus maritimus*) in Texas are represented by two subspecies that occupy different portions of the coast. The Louisiana Seaside Sparrow (*A. m. fisheri*) occupies the northern and central parts of the Texas coast to somewhere north of Corpus Christi, and the Texas Seaside Sparrow (*A. m. sennetti*) occupies a smaller area south of Corpus Christi. An apparent intergrade zone occurs around Corpus Christi (Woltmann et al. 2014). We analyzed genetic (microsatellite) data from representative populations of both subspecies collected in 2003-2006 and 2012 in order to (1) describe general population genetic characteristics of the different populations, (2) estimate effective genetic population sizes (Ne), and (3) ask whether any of the populations have experienced recent population bottlenecks (as might be expected in small populations impacted by hurricanes). Allelic richness (NA) was lower in both samples of *A.m. sennetti* (~ 6.3) than in samples from all other populations (range 8.6 – 10.1), and observed heterozygosity (Ho) followed a similar pattern (~0.75 vs ~0.81). Effective population size estimated with the temporal method suggested lower Ne in *A.m. sennetti* (Ne = 131, 95% CI = 50-?) compared to *A.m. fisheri* (Ne = 274, 95% CI = 131-???). Although Texas Seaside Sparrows occupy a very small geographic area, the population genetic characteristics we measured do not raise any obvious conservation concerns at this time. Ongoing genetic monitoring is, however, recommended.

**Make movement advancements for autonomous radio telemetry networks**

Jeremy D. Ross, Oklahoma Biological Survey, University of Oklahoma; Jessica E. Ruyle, University of Oklahoma; Eli S. Bridge, Oklahoma Biological Survey, University of Oklahoma

In the interest of expanding the accessibility of autonomous telemetry networks to biologists, we have developed new approaches to the assembly and operation of transmitting and receiving hardware. Our transmitter design incorporates commercially-available electronic components at a cost well below commercial options. We are able to readily program these to produce a variety of radio transmission frequencies, binary "barcode", and context-operation patterns for a variety of field biology purposes, including incorporation into autonomous telemetry networks such as Motus. Our receiving antenna design is likewise much cheaper than commercial products, having been mostly sourced from materials at local hardware stores with only the coaxial cables and connectors purchased from specialized outlets. It was designed for optimal operation at the standard frequency of the Motus network (166.38 MHz). Relative to commercially-available options currently used in the Motus network, our antenna design produces a much more favorable signal-to-noise difference, mostly by reducing baseline static noise. Altogether our innovations should not only increase the accessibility of autonomous telemetry for limited-budget biological studies, but they also improve the technology being implemented so that the amount of information transmitted and possible applications for the system can be greatly expanded.

**Conservation and management of the North American Black Tern (*Chlidonias niger surinamensis*) in Michigan**

Erin Rowan, Detroit Audubon; Caleb Putnam, Audubon Great Lakes, Michigan Department of Natural Resources

The North American Black Tern (*Chlidonias niger surinamensis*) has experienced severe population declines in the Upper Great Lakes and Prairie Pothole regions of the U.S. over the past 30 years. The species is now listed as ‘Endangered’ in several states and as a ‘Species of Conservation Concern’ in most others. In particular, this species’ numbers in Michigan are perilously low, and Wisconsin populations have been in serious decline for the past 30 years, without a clear understanding of the underlying causes. In response to population declines, Black Tern was identified as a focal species for conservation planning in the Upper Mississippi River and Great Lakes Region Joint Venture Waterbird Habitat Conservation Strategy. Similarly, the Upper Mississippi Valley/Great Lakes Waterbird Conservation Plan considers Black Tern a species of “high” conservation concern. Population demographic information for most Black Tern colonies in the Great Lakes Region is lacking. To address this knowledge gap, Audubon Great Lakes and Detroit Audubon began a long-term mark-recapture study in 2013 at the largest remaining colony of Black Terns in Michigan at Saint Clair Flats. Additional population monitoring studies began in Ogontz Bay in 2016 and are projected to start in Wigwam Bay in 2018. This state-wide research aims to identify the population pressures that are contributing to the decline of the Black Tern in the Great Lakes Region. The results of this study to-date indicate that productivity in Michigan is high, however further study is needed to determine adult and juvenile survivorship, site fidelity and colony exchange.

**Form follows function: the effect of function on signal evolution in the genus *Malurus***

Shailee Shah, Columbia University; Emma I. Greig, Cornell Lab of Ornithology, Mike S. Webster, Cornell University

The function of a vocalization can influence its acoustic structure in many ways and ultimately constrain its evolutionary trajectory. We examined the effect of function on signal evolution by comparing the structure of calls with three different functions across nine species of fairy wrens (Maluridae: *Malurus*). We hypothesized that calls would vary across species depending on their function. In terms of context and information, calls conveying the presence of threat would be constrained by factors affecting sound transmission, whereas calls maintaining contact with conspecifics would be constrained by species-specificity. In terms of intended recipient, calls used for heterospecific communication would converge more than calls used for conspecific communication to enable signal recognition. Alarm calls known to elicit heterospecific response (“seet” calls) were more similar across species than “chatter” or “contact” calls, which are used, respectively, as mobbing and contact calls. Variation in “contact” calls showed phylogenetic signal as expected under a Brownian motion model of evolution, and higher phylogenetic signal than “seet” and “chatter” calls. Because they are used for conspecific communication, “contact” calls may experience selection consistent with traits facilitating species recognition in Malurus. Conversely, “seet” calls may experience directional selection due to constraints on propagation and detectability of the alarm signal. They may converge further to facilitate heterospecific communication. Finally, “chatter” calls, despite their use in heterospecific communication as mobbing calls, may also be used in conspecific contexts that select for divergence. We conclude that difference in function can lead to different patterns of signal evolution.

**Studying novel functions of female song: Vocal response to nest predators in female Eastern Bluebirds (*Sialia sialis*)**

Evangeline Shank, University of Maryland, Baltimore County; Derek Coss, UMBC; Michael Rowley, UMBC; Joselyne Tonleu, UMBC; Kevin Omland, UMBC

Odom et al. (2014) recently demonstrated that female song is widespread and ancestral in all songbirds. Ornithologists have long known that that females sing in many tropical songbirds. However, studies of female song in temperate regions remain scarce. In the past, several researchers reported female Eastern Bluebirds singing in the presence of predators. I recorded 15 pairs of bluebirds throughout the 2016 breeding season. Using these recordings, I compared seven standard song measurements to compare the complexity of male and female songs. I found that male and female songs were not structurally different based on these various measures of frequency and duration. I propose to look at the function of Eastern Bluebird songs in the presence of various predator models to determine the function of female song. Additionally, I will test for the occurrence of female song in other contexts, (e.g. territory defense and mate guarding) by presenting male and female bluebird models. Preliminary results suggest that female bluebirds increase their song rate in the presence of black-rat snakes, a common nest predator. I will continue to collect data throughout the 2017 breeding season to compare behavioral and song rate data of female Eastern Bluebirds in response to various mount presentations.

**American Woodcock reproductive rates in relation to forest structure at local and landscape scales**

Alexandra Shoffner, Michigan State University; David Luukkonen, Michigan Department of Natural Resources, Michigan State University; David Williams, Michigan State University; Scott Winterstein, Michigan State University

Long-term declines in American Woodcock (*Scolopax minor*) abundance have been documented in Michigan as well as range-wide since consistent monitoring began in 1968. Available demographic estimates for woodcock indicate that declines in abundance may be linked to declines in reproductive rates associated with changes in breeding habitat characteristics. To better understand the relationship between habitat and woodcock population dynamics, we will determine the effects of local and landscape-scale habitat characteristics on woodcock reproductive rates in two distinct ecological regions of Michigan. We located female American Woodcock and their nests using trained volunteer woodcock banders and their pointing dogs. We assessed nest success and documented predators of woodcock and their nests by placing trail cameras at nests. We measured survival by capturing, radio-tagging, and monitoring adult female and juvenile American Woodcock. We measured and evaluated variables relevant to woodcock reproductive rates, such as temperature, precipitation, body condition, as well as variables describing habitat structure at local and landscape scales. We will present preliminary findings from this recently initiated study. Future results will be used to recommend habitat treatments that enhance woodcock reproductive rates and thus help halt or reverse woodcock population declines.

**Estimating apparent survival and factors influencing population dynamics of Neotropical birds**

Elsie Shogren, Kansas State University; Alice Boyle, Kansas State University

Neotropical bird communities are renowned for their diversity, and species have adapted to remarkably constant abiotic environments compared to those at higher latitudes. Thus, global climate change and shifting precipitation regimes have the potential to disproportionately affect avian population dynamics in tropical regions. Basic demographic parameters remain unknown for many species in the Neotropics; describing these parameters and the response of species to variation in annual precipitation is key to understanding population dynamics and potential effects of changing climate. I used Cormack-Jolly-Seber live-recapture models to estimate apparent survival and recapture probability for eight bird species in a montane tropical forest. I constructed capture histories from data collected across seven years of mist-netting effort on the Caribbean slope of Costa Rica. For all species, constant and time-since-marking models were top-ranked. I also modeled annual precipitation and effort as covariates, to test their effect on estimates of apparent survival. Models including precipitation received some support in most species, but direction of response varied by species. Ground foraging birds had negative relationships between precipitation and estimates of apparent survival, while species foraging at higher levels in the forest showed neutral or positive relationships between precipitation and estimates of apparent survival. These results provide novel estimates of apparent survival for three bird species and additional information to supplement previously published estimates for the remaining species. The observed patterns highlight the complexity of interactions between abiotic factors and diverse biotic communities in a Neotropical ecosystem where varied and dramatic effects of climate change are expected.

**Foraging observations and insights on Neotropical migrant warblers from Ecuador**

Eric Sibbald, Cornell University; Eliot T. Miller, Cornell University; Robert C. Dobbs, USGS

Many neotropical migrants are declining due to anthropogenic changes, from a variety of factors on the breeding and wintering grounds. Unfortunately, for many species very little is understood about the habitat use and foraging niches of neotropical migrants while on the wintering grounds in comparison to the breeding range. Historically, the breeding ground has been where most of the research on the species has taken place, focusing on all aspects of life history. However, the habitat for many species on the breeding ground is far different than on the wintering ground, and therefore is important to look at to understand population changes. Our project involved collecting and analyzing foraging observations from neotropical warblers in Ecuador, which primarily consisted of Blackburnian Warbler *(Setophaga fusca*), Cerulean Warbler (*Setophaga cerulean*), and Canada Warbler (Cardellina canadensis). These observations have allowed us to identify the foraging niches for these species, and compare how the differ and what they need. We have been able to compare male and female, adult and juvenile, and flocking vs. non-flocking birds as well, and therefore identify what habitat is critical for these species in the neotropics while they are on their wintering grounds.

**Cerulean Warbler habitat use in northeast Iowa**

Paul Skrade, Upper Iowa University; Chase H. Grabau, Upper Iowa University; Cory J. Thielen, Upper Iowa University; Jon W. Stravers, Driftless Area Bird Conservation

The Cerulean Warbler (*Setophaga cerulea*; CERW) is a species of conservation concern across its breeding range. However, in northeast Iowa near the Mississippi River there is a population that appears to be doing quite well. In 2006 a concerted effort was made to document avian species in the region and subsequent surveys in Yellow River State Forest (YRSF) yielded surprising numbers. In 2015, 185 different territorial males were located within the boundaries of the state forest. An initial landscape-scale analysis of those territory locations found that the birds preferred territories on a slope (mean 29.2% grade), with no preference for any particular aspect, and that are close to water (mean distance 148.8 m). However, the main territory association was with areas of the state forest classified as “limited management”. This forest is managed for productivity as well as recreation and wildlife habitat and the limited management areas tend to have larger deciduous trees. In the 2016 field season avian point count surveys for CERW and vegetative sampling in YRSF were conducted within the males’ territories to gain a better understanding of the fine-scale habitat preferences. These included determining the dominant tree species by abundance and diameter at breast height (DBH) as well as a count of young trees to predict future forest composition. Maples were the most abundant overall but it evident that males were selecting territories that contained large walnuts and oaks and sites with overall greater tree diversity.

**Nesting Success of Hooded Warblers in Exotic Shrubs: Multi-Trophic Interactions in the Forest Understory**

Gregory A. Smith, Kent State University at Stark; Ryan J. Trimbath, University of Akron; Daniel R. Garrett, University of Sherbrooke

Temperate forests of North America are being altered by the combined effects of two ecosystem engineers: white-tailed deer, *Odocoileus virginianus*, and exotic earthworms. We used an exclosure study in Northeast Ohio to quantify the impacts of deer and earthworms on forest plant community structure, and use the results to inform a study of nesting success in Hooded Warblers (*Setophaga citrina*). Our results suggest that interactions between deer and earthworms serve to reduce native plants and increase exotic plants. Unfortunately, past research suggests that avian nests in exotic shrubs are more susceptible to predation and represent an ecological trap. Hooded Warblers, a forest understory obligate, provided a model with which to test this idea. In our study, Hooded Warblers primarily selected exotic plants for nesting sites (73% of 133 nests), even when native substrates were available. We analyzed the influence of nest-site choice on nest success at the nest and patch scale and found no relationship between nesting success and exotic species. However, we did find that nests in exotic plants initiated later in the season were more likely to fledge offspring. For our system, landscapes dominated by exotic shrubs do not appear to be ecological traps for Hooded Warblers. In such disturbed landscapes, where the availability of native understory plants is limited, exotic plants may provide a reasonable opportunity for successful nesting, especially later in the season. In some instances, exotic plants may provide the only available nesting substrate. Such ecological interactions speak to the complexities of invasive species management.

**Effects of urbanization on prevalence, diversity, and parasitaemia of avianHaemosporidaparasites**

Jamie Smith, Western Michigan University; Dr. Kathleen Baker, Western Michigan University; Dr. Sharon Gill, Western Michigan University; Dr. Maarten Vonhof, Western Michigan University

Urbanization drives ecological and evolutionary change by decreasing biodiversity and altering relative abundances, disrupting community structure and influencing species interactions. Host-parasite interactions are particularly susceptible to the effects of urbanization as competent host and vector populations must overlap for transmission to occur, and urban areas may support smaller, less diverse vector communities. We explored the effects of urban land use on patterns of blood parasitism by Haemosporida in birds and tested the hypothesis that urban birds would experience lower prevalence, intensity, and diversity of parasites. We collected blood samples from 726 songbirds (Passeriformes) across an urbanization gradient in southwest Michigan using a randomized, spatially-balanced sampling strategy. We used principal components analysis to define three components that explained variation in urbanization, vegetation, and water availability. Samples were screened for parasite presence using molecular and microscopy techniques. We identified 71 parasite lineages of three Haemosporida genera (*Haemoproteus*, *Plasmodium*, and *Leucocytozoon*) and found that 41% of birds were infected with one or more lineages. Preliminary data suggest that Haemosporida prevalence and diversity both decreased with increasing urbanization, and parasite diversity declined with decreasing water availability. Prevalence also varied between host species, from 0% in White-Breasted Nuthatches to 85% in Chipping Sparrows, and between parasite genera; *Plasmodium* was the most prevalent genus (24%) and *Leucocytozoon* the least (6.4%). Our results suggest that anthropogenic land use change and the distribution of water on the landscape can alter the distribution and success of vector-borne parasites, with important implications for the dynamics of host populations and communities.

**Effects of environmental temperature and human disturbance on incubation behavior and egg temperatures of Least Terns (*Sternula antillarum*)**

Robert Snowden, University of North Carolina Wilmington; Raymond Danner, University of North Carolina Wilmington

Beach-nesting seabirds often face direct thermoregulatory demands from the variable environmental conditions at their breeding sites. High temperatures not only increase the likelihood of thermoregulatory stress for adults at exposed nests, but also challenge their ability to maintain suitable incubation conditions. Beach-nesting seabirds are also typically subject to human disturbances at many breeding sites, which may inhibit behaviors that could help regulate nest temperature, and therefore exacerbate thermal stress on eggs. My project seeks to understand how environmental temperatures and human disturbance affect the ability of beach-nesting Least Terns to maintain optimal incubation temperatures through behavioral mechanisms. I hypothesize that 1) Least Terns will adjust incubation behavior to response to increasing environmental temperatures; 2) human disturbance affects these incubation behaviors, and therefore egg temperature; and 3) there is a critical environmental temperature above which terns fail to behaviorally-regulate egg temperatures, and disturbance events at such critical temperatures increase the likelihood of egg temperatures reaching harmful levels. I am currently monitoring Least Tern colonies on beaches near Wilmington, North Carolina, where I am quantifying egg temperatures by deploying data-logger-equipped artificial eggs in target nests. I am concurrently conducting visual surveys to quantify potential thermoregulatory incubation behaviors at those nests, and also am recording behavioral responses to human-induced disturbance events. By quantifying thermal tolerance limits, this study can provide important management information in anticipating impacts of increased environmental temperatures on seabird productivity, and could help determine if additional precautions are necessary to protect seabird colonies from human disturbance.

**Geometric morphometrics and the evolution of bill shape in Babblers (Timaliidae)**

Nicholas Souza, Loyola University Chicago; Matthew Bonfitto, Loyola University Chicago; Sagar Chaudhari, Loyola University Chicago, Julie Witkowski, Loyola University Chicago, Michael Hanson, Loyola University Chicago, Sushma Reddy, Loyola University Chicago

The systematics of the Timaliidae has undergone remarkable changes in recent years. In addition to dramatic rearrangements in the relationships across the family, many of the traditional genera grouped together based on bill morphology or ecology are not monophyletic, including groups categorized by these features such as Scimitar-, Tit-, and Tree-babblers. This implies that these seemly characteristic bill shapes are highly labile or evolved multiple times (parallelism). We undertook a morphometric study using standard linear measurements and 2D lateral landmark-based analyses to examine bill shape variation across these species. We investigated whether these features can be considered convergent (same feature evolved multiple times) or whether there are constraints to bill and body traits that mirror their phylogenetic relationships. We used multivariate statistics to examine whether 1- the superficial designations of curved, thin, thick can be discriminated in morphospace, 2- the shape within clades was discrete or more similar to their ecological categories, 3- there are aspects of bill shape that are constrained or changing in modular fashion to explain the high amount of variation in this group. Although bill shape is considered to be highly indicative of feeding ecology, only a few quantitative analyses have characterized and examined the evolution of this key trait across a diverse family.

**Do Barn Swallows settle in an ideal free distribution?**

Mark Stanback, Davidson College; Esther Niemasik, Cornell University

Although Barn Swallows (*Hirundo rustica*) are not territorial in the traditional sense and are willing to nest quite close to adjacent pairs of swallows, there are limits to their tolerance of neighbors. In previous work, we showed that Barn Swallows are very willing to nest in artificial nest cups as close as 122 cm from active nests, but prefer not to nest 61 cm from such nests. In the current study, we attached nest cups in pairs on the underside of a pier. Cups within pairs were 61 cm apart; adjacent cup pairs were 122 cm away. Because the number of breeding pairs exceeded the number of cup pairs, some birds were forced to nest 61 cm from active nests. If Barn Swallows settle in an Ideal Free Distribution, we should expect all cup pairs to be settled by a single pair of birds before any are settled by a second pair of birds. We monitored Barn Swallow settlement at 18 cup pairs for seven years. We found that Barn Swallows do not settle randomly with respect to near-neighbor distance. As predicted from an Ideal Free Distribution, they showed a significant aversion to “doubling up” at cup pairs and did not do so until most cup pairs were already occupied.

**Changing phenology of landbird migration at Chicago, Illinois: multiple datasets**

Douglas Stotz, Field Museum of Natural History; Paul Clyne, Chicago, IL; Michael Speer, Notre Dame University

We investigate the changing timing of landbird migration around Chicago using three datasets. We compared migration counts along the Chicago lakefront in Lincoln Park by William Drueth (1928-1943) to compilations by Paul Clyne in Jackson Park (1981-2005). Of 90 species in both datasets for spring migration, 46 arrived more than a week earlier and 38 earlier by less than a week in the Jackson Park sample. We used a sample of window kills from McCormick Place on the Chicago lakefront to compare changes in migratory arrival and departures between the early 1980s and the late 2000s for 5 very common species (Veery, Ovenbird. Common Yellowthroat, White-throated Sparrow, and Swamp Sparrow). In spring, all arrived earlier, peaked earlier and departed earlier by 2 to 7 days in the 2000s sample. No differences were noted in timing of fall migration, and no changes in the relative timing of sexes occurred between the time periods. We also used e-bird data from Cook County, Illinois to examine timing of arrival, peak and departure of 113 species of landbirds in the extraordinarily warm spring of 2012. 75 species showed evidence of earlier migration (averaging 1 week earlier) in at least one of these parameters compared to an average of the previous 10 years. Species wintering in the southeastern US were more likely to arrive early than species that winter in Middle America. Species that winter in South America showed less evidence of a response to the warm spring in timing of migration.

**Light, noise or social factors? Exploring influences on the onset of dawn song in House Wrens**

Carley Stuart, Western Michigan University; Erin E. Grabarczyk, Western Michigan University, Maarten J. Vonhof, Western Michigan University, Sharon A. Gill, Western Michigan University

Every morning, male songbirds wake from sleep and begin their daily activities, one of which is to sing. Male songbirds sing to advertise themselves and their territories, making singing a critical feature for breeding and fitness. Social factors, such as the mate’s breeding stage and that of their neighbors, as well as environmental factors, such as temperature, influence when male songbirds start to sing. Recent changes in environments caused by humans, including increased noise and light pollution, could also affect the timing of dawn song, with birds waking earlier due to increased light and noise exposure. We recorded the onset of dawn singing by male House Wrens (*Troglodytes aedon*), measured light and noise pollution around nest boxes, and considered whether these or social factors influenced when house wrens gave the first song of the day. On average, males first sang 30 min after sunrise. Our preliminary analysis of male song during the first month of the breeding season found that timing of the first song was not related to night-time sky brightness or sound pressure levels measured between 0-2 kHz. Instead of noise and light pollution, pairing status influenced when males begin to sing, with paired males singing earlier than unpaired birds. Unlike species that sing prior to sunrise, our results suggest that noise and light pollution do not alter the onset of dawn singing by House Wrens.

**JP Chickadee project: big data from a little bird**

Ivan Swart, Northern Michigan University; Alec Lindsay, Northern Michigan University; James VanOrman, Northern Michigan University

Black-capped Chickadee (*Poecile atricapillus*) behavior has been studied in with captive individuals, or color-banded wild populations. Recent developments with RFID technology provide a new mechanism for compiling large datasets of movement records, social affiliations, foraging behavior, nesting behavior, and more. We have initiated a study of Black-capped Chickadees in a semi-urban environment, documenting behavior with RFID tags and readers built into seed feeders. Here we present a first-pass analysis of these data, looking at 1) the stability of within-sex dominance structures of winter foraging flocks, 2) the relationship between dominance hierarchies within winter foraging flocks and how those correlate with pairing of mated individuals during the breeding season, and 3) of the fine-scale analysis of the temporal and spatial patterns observed as social affiliations in foraging flocks dissolve into paired associations between breeding individuals. Along with novel insights into chickadee social behavior, these preliminary data demonstrate the expanded analytical capabilities provided by the use of RFID technology in the study of multiple facets of Black-capped Chickadee natural history.

**Are you my mommy: assigning parentage in populations with kin structure and incomplete parent sampling**

Caroline Thow, University of California, Santa Cruz; Bruce Lyon, University of California, Santa Cruz; Caitlin Wells, University of California, Davis; John Eadie, University of California, Davis

Identifying parents of offspring from a candidate parent pool is essential for estimating reproductive success, providing insight into the evolution of alternative reproductive strategies such as cooperative breeding, extra-pair paternity, and conspecific brood parasitism (CBP). CBP occurs when females lay eggs in nests of conspecifics without providing further care. CBP is widespread but especially prevalent in waterfowl, where females are philopatric and may parasitize relatives, parasites may not nest, and male sampling is infrequent. Molecular parentage assignment programs are powerful tools, but may falsely exclude parents when the population contains relatives or sampling is incomplete, biasing assignments towards relatives or sampled individuals and creating patterns unrepresentative of system dynamics. Recent studies suggest that CBP may be kin-directed and cooperative rather than parasitic, but to verify this we must test the accuracy of parentage assignment programs under common conditions in CBP. We investigated the reliability of maternity assignments in CBP using simulated Wood Duck (*Aix sponsa*) populations of known pedigree. We ran maternity analyses excluding males and/or non-nesting females in two popular programs: Colony and Cervus. Excluding males did not affect either program, but the absence of non-nesting females increased false assignments. Misassignment rates peaked when we removed males and non-nesting females, with Cervus misassigning 20% of offspring to individuals unrelated and related to the true mother. Even including all females, both programs made occasional mismatches to relatives. These results suggest that CBP may be overreported, particularly between relatives, and investigations using genetics to assign parentage should interpret results cautiously.

**Monitoring songbird stopover in fragmented forest-agricultural systems**

Jessica Tinklenberg, Purdue University; John Dunning, Purdue University; Jeff Buler, University of Delaware

Populations of Nearctic-Neotropical migratory landbirds have declined in recent decades, in part due to factors impacting the migration period. Thus, recent work has emphasized the migratory period as a conservation priority. The ability to identify heavily-used, high-quality migratory stopover sites is a necessary first step to understanding the ecological roles of stopover habitat. Several studies have begun to describe critical stopover areas in well-known migration hotspots (e.g., the Gulf of Mexico). However, the stopover ecology of birds in the vast expanse of seemingly low-quality agricultural land in Midwestern United States remains unknown. Through this project we aim to determine 1) where important stopover areas occur within the fragmented forest-agricultural matrix of Indiana, 2) what is the role of small forest patches as stopover habitats, and 3) how distributions and populations of migrants passing through Indiana have changed over the last decade using archived weather surveillance radar data and previously-collected bird abundance survey data. By integrating surveys of bird abundance data from 2005-2007and both archived and current NEXRAD (next-generation weather surveillance radar) reflectivity data (2005-2007, 2015-2017), we are developing a map of migrating landbird stopover densities during fall and spring, and identifying priority areas for targeting conservation of migratory birds and their habitats across most of Indiana. Identifying these important stopover habitats in Indiana will allow us to better conserve migratory landbird species that migrate through the agricultural Midwest.

**Migratory Movements and Wintering Locations of a Threatened Population of Black-crowned Night-Herons**

Christopher Tonra, The Ohio State University; Laura Kearns, Ohio Division of Wildlife; Kristie Stein, The Ohio State University

Black-crowned Night Herons (*Nycticorax nycticorax*) in the Great Lakes have been declining since the 1970's. While much attention has been given to the effects of Double-creasted Cormorants (*Phalacrocorax auritus*) on nesting colonies and colony restoration, very little is known about the migratory connectivity and flyway utilization of this population. We utilized satellite telemetry and the Motus Wildlife Tracking system to determine wintering locations and migratory behavior/routes of adult and juvenile night-herons from colonies in the western basin of Lake Erie. All birds tagged utilized the Atlantic Flyway during fall migration, primarily passing over the crest of the Appalachian Mountains. We found substantial variation in migration phenology, particularly fall departure dates and frequency of stopover. The majority of adults overwintered in Florida, while two birds divided their overwintering range between Florida and Zapata Marsh, Cuba. Juvenile behavior appeared similar to adults, with the exception of making several multi-directional dispersal movements prior to southward migration, based on Motus network tower hits. We discuss the conservation implications of these findings, including the need for multi-state cooperation in protecting this declining population.

**The effect of blood parasites on Nuttall’s White-crowned Sparrow song**

Joleen Tseng, San Francisco State University

In the Nuttall’s White-crowned Sparrow (*Zonotrichia leucophrys nuttalli*), song plays an important role in territory defense and mate attraction. Different populations have their own unique dialect which has been extensively described in the San Francisco Bay area for over 50 years. Dialects are learned from neighboring adult birds and are not inherent, meaning that dialects are subject to variation due to geographic location and the proper development of song-learning centers in the brain. Some avian blood parasites have been shown to affect brain development and have the potential to affect the formation of complex song in some birds; however, the effects vary widely in different species. It is still unclear how great of an impact blood parasites have on birds, especially for species that are regularly exposed to blood parasites. The great diversity of blood parasite life histories and infection strategies unfortunately leads to immense variation in symptoms, making it difficult to generalize their effect for even a single family of birds. With this in mind, I will focus on comparing song quality between infected and non-infected Nuttall’s White-crowned Sparrows with two different dialects. I hypothesize that infection will lower the quality of their song and the effect will be different in the two dialects. The results from this study will help us to continue teasing apart the effect blood parasites have across different bird populations. Blood parasites are present on nearly every continent and have potential to cause the extinction of unsuspecting species. To understand the interactions they have with our local wildlife would greatly benefit future management and conservation plans to preserve biodiversity.

**Impacts of mammalian predators on species- and niche-based community assemblages in the world’s seabird biodiversity hotspot**

Christy Wails, Northern Illinois University; Stephanie Borrelle, Auckland University of Technology; Rachel Buxton, Colorado State University; Holly Jones, Northern Illinois University

Islands support some of the greatest numbers of endemic species but are highly vulnerable to anthropogenic activities, including the introduction of invasive, predatory mammals. Mammal eradication is a primary conservation tool to protect island communities, yet little is understood about how communities reassemble and how assembly patterns influence island ecosystem. We examined species- and niche-based community assemblages of seabirds nesting across nine outlying island archipelagos of New Zealand – the world's seabird biodiversity hotspot – in relation to mammal introductions and eradications. We grouped seabirds into functional ‘niche-based’ groups based on marine and terrestrial habitat use for all seabirds distributed across New Zealand (orders Sphenisciformes and Procellariiformes; Pelecaniformes families Pelecanidae, Sulidae, Phalacrocoracidae, Fregatidae, and Phaethontidae; and Charadriiformes families Stercorariidae, Laridae, and Sternidae). To assess whether recovery was occurring at restored islands and determine if seabird communities were similar between restored and invaded or uninvaded sites, we developed generalized linear mixed-effects models (GLMMs) comparing species- and niche-based community assemblages using data from uninvaded and currently invaded islands. We found that island biodiversity indices of species- and niche-based communities differed significantly with greater diversity among species-based community composition. Although our results suggest there are considerable differences between species-based communities, this trend was more strongly related to geography whereas niche-based communities were tied to island histories, with niche-based assemblages on recovering islands being more similar to that of uninvaded systems. Our results demonstrate the importance of considering species functional roles when evaluating ecosystem recovery.

**Determining breeding home ranges of a rare, high-elevation specialist, the Bicknell’s Thrush (*Catharus bicknelli*), in north-central New Brunswick**

Christopher Ward, University of New Brunswick; Tony Diamond, University of New Brunswick; Joe Nocera, University of New Brunswick

The Bicknell’s Thrush (*Catharus bicknelli*) is a rare, neotropical migratory songbird which breeds in high elevation stunted growth forests in north-eastern United States and eastern Canada. In New Brunswick, Bicknell's Thrush occupy industrial forest stands undergoing vigorous regrowth post-clear-cutting, and have experienced a decline of 11.5% annually from 2002-2011. Current population estimates of the Bicknell’s Thrush comprised of point-count surveys combined with rough habitat models are inaccurate for the region. Assessing population density and habitat use is a vital next step since outlining their geographic occurrence in order to improve population estimates. Using a mix of passive and active radio telemetry to track individual birds, home ranges are calculated throughout the breeding season while monitoring tracked female's nests. The result is a dynamic home range where changes in spatial use can be determined between breeding stages. The calculation of home ranges also included determination of overlap, continuity and contiguity, thereby allowing the estimation of population density within their geographic occurrences. A clearer understanding of how Bicknell’s Thrush use their space within their geographic occurrence range in New Brunswick can improve the understanding of ongoing conservation monitoring of this federally threatened bird by government and non-government agencies within the province.

**Analysis of an avian disease network in the Greater Yellowstone Ecosystem: Opportunities for undergraduate student engagement while testing null models**

Becky R. Watkins, Northwest College; Kayla Harakal, Northwest College; Chloe D. Winkler, Northwest College; Aislee E. Atkinson, Montana State University; Eric C. Atkinson, Northwest College & University of Wyoming

Supported by INBRE (NIH), nearly 20 undergraduate students have participated in original avian disease monitoring at Northwest College since 2013. We sampled over 262 birds of 33 species, 19 families, and 5 orders in the Greater Yellowstone Ecosystem for West Nile virus, avian malaria, enteric bacterial communities, and intestinal coccidia. This sampling effort is ongoing with screenings for malaria and enteric pathogenic bacteria in early stages, while environmental sampling for biting dipterans including mosquitoes, black flies, and biting midges to assess vector communities has started. Thus far, WNV level was not related to family (F6,207 = 0.467, p = 0.832) and, surprisingly, American Robins (*Turdus migratorius*) show little viremia. Passerine salivary virus levels varied through the year with peaks in March, June, and July. Notably, early peaks precede emergence of suitable vectors. Differences in white blood cell counts among species were also apparent (i.e., House Sparrow, *Passer domesticus*, < House Finch, *Haemorhous mexicanus*). Genetic screening for avian malaria may show promise in elucidating correlations between leukocyte abundance as heretofore, visual screens of blood smears for malaria presence do not. To statistically assess disease, bird, and vector interactions across the landscape, we modeled multiple bipartite networks based upon vector, parasite, and host relationships gleaned from the literature and MALAVI. Data gathered in this study were then modeled and compared against this hypothetical null model.

**The Rangeland Watershed Initiative: Building partnerships to enhance bird habitat on private lands**

Carrie Wendt, Point Blue Conservation Science; Kelly Garbach, Point Blue Conservation Science

Approximately 50% of current viable bird habitat in California is on privately owned land, making farms and rangeland an increasingly important refuge for birds and wildlife. The Rangeland Watershed Initiative (RWI) is a partnership between Point Blue Conservation Science and the Natural Resource Conservation Service (NRCS) that works directly with farmers and ranchers to enhance and protect bird habitat on private lands throughout Central and Northern California. Our team of 14 Partner Biologists work in NRCS offices as conservation planners. In addition, we monitor ecosystem function on rangelands by measuring the diversity and abundance of focal bird species as ranchers change management practices and enhance bird habitat. We use presence and abundance of indicator birds as a metric of ecosystem health. RWI currently conducts breeding bird surveys, both point counts and area searches, on approximately 70 ranches across 19 counties in California. The goals of this research are to monitor changes in bird and vegetation communities as ranchers change grazing practices and implement NRCS incentive programs. Initial results indicate that diversifying forage plants, installing cross fencing, and watering facilities away from streams and ponds may improve bird habitat as well as livestock health. This research highlights the importance of building partnerships and working on privately owned agricultural lands that birds depend on.

**Bridging the research-management divide: A collaborative spatial approach to conservation for species at risk using the Canada Warbler (*Cardellina canadensis*)**

Alana Westwood, Dalhousie University; Dan Lambert, High Branch Conservation Services; Len Reitsma, Plymouth State University

The Canada Warbler (*Cardellina canadensis*) is a small passerine facing population declines across its range. It is listed as Threatened in Canada and a Species of Greatest Conservation Need in nearly every U.S. state in which it occurs. Though habitat associations differ across the range, in Bird Conservation Region 14 (Atlantic Northern Forest), this species predominantly breeds in wet deciduous and mixedwood forests. Conservation and management of this migratory species requires a concerted, multi-jurisdictional effort. Forest managers and conservationists both have the same needs: identifying locations to apply interventions, and determining the appropriate intervention for that type of site. We provide a tool to support both objectives by pairing spatial conservation solutions with corresponding habitat management guidelines. Building upon efforts in the northeastern U.S. portion of BCR 14, we engaged in an iterative consultation process with 31 experts and stakeholders from 9 provinces and states. Using predicted Canada Warbler density in BCR 14 (Boreal Avian Modelling Project; Haché et al. 2014), we developed maps of spatial opportunities for three scenarios, ranging from strict in-situ conservation to active habitat management. We used Zonation (Moilanen 2007) to locate desirable areas within each scenario based on expert weighting and connectivity as related to regional protected areas systems, fragmentation, and dispersal. We present spatial solutions across these three conservation and management scenarios, as well as their complementary habitat guidelines for protected areas and managed forests.

**Complex drivers of Grasshopper Sparrow (*Ammodramus savannarum*) nest success**

Sarah Winnicki, Kansas State University; W. Alice Boyle, Kansas State University

Grassland bird populations have experienced more consistent and widespread declines than any other bird guild in North America, and the most promising path to mitigating and reversing these declines lies in developing effective management strategies based on understanding of key demographic rates. We sought to identify the factor(s) which affected the nest success of Grasshopper Sparrows (*Ammodramus savannarum*), grassland-obligate songbirds native to North and Central America. Over three summers we located and monitored sparrow nests (N=274) at the Konza Prairie Biological Station. Using RMark, we created a set of competing known fate models which assessed the relative importance of six hypothesized drivers of nest success: temporal variation, edge effects, vegetative cover, clutch size/investment, breeding male density, and Brown-headed Cowbird (*Molothrus ater*) brood parasitism. Our top-ranked model contains every hypothesized factor except for density, and demonstrates the importance of representing ecological complexity in analyses of demography.

**Habitat associations of warblers migrating along the Lower Texas Coast**

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Although our knowledge of passerine habitat requirements during the breeding season is vast, less research has been conducted on habitat associations during migration. The lower Texas coast provides important stopover habitat for many birds, and its position adjacent to the Gulf of Mexico makes it the first landing spot for many trans-Gulf migrants. Thus, it is important to understand characteristics of stopover habitat in this region to aid future migratory bird conservation efforts. At least 42 out of the 49 wood warbler species (family *Parulidae*) that reside in North America can be found in Texas at some point during the year, making this an ideal group to investigate. En-route migrants are believed to assess the quality of an unfamiliar landscape through physiognomic traits. Thus, we investigated habitat (e.g., physiognomic classes) associations of wood warblers along the lower Texas coast. Warblers were surveyed during spring and autumn migration from 1991–1993, and again from 2006–2008. Surveys were conducted along 110-500 m transects placed within 5 common physiognomic classes along the lower Texas coast. Using DISTANCE 7.0, densities (birds/ha) of warbler species were determined in each class. Overall, 27 warbler species were observed during the study period, with the highest number of species occurring on wooded transects (n = 23). The most commonly observed species were Common Yellowthroat (*Geothlypis trichas*; n = 60) and Black-and-White Warbler (*Mniotilta varia*; n = 46). Results from this study will help us understand what type of habitat is valuable to each warbler species during migration.

**Stable isotope and mercury analyses of the Galapagos Islands seabird community**

Anna Zarn, University of North Carolina-Wilmington; Carlos Valle, University of San Francisco Quito, Steven Emslie, University of North Carolina Wilmington

Tropical oceans have limited food resources when compared to polar or temperate oceans, which impact the foraging habits of tropical seabirds. Understanding foraging strategies through delta-15N and delta-13C stable isotope analysis is a valuable technique for investigating dietary shifts in seabirds. Mercury (Hg) analysis can be performed in conjunction with stable isotope analysis for a more thorough understanding on contaminant exposure with foraging behavior. Because the Galapagos Islands seabird community is directly impacted by El Niño Southern Oscillation (ENSO) cycles, understanding their foraging behavior before, during, and after these events is important for future conservation plans. However, little research has been done with Galapagos seabirds at the community level. This study addresses the following questions: (1) is there inter-island variation in diet within species as indicated by differences in stable isotope and Hg values, (2) what is the relationship between trophic level and Hg exposure among species, and (3) is there a shift in stable isotope values, and thus diet, in species before, during, and after the 2015 ENSO event? Eight seabird species (*Sula sula*, *Sula nebouxii*, *Sula granti*, *Phaethon aethereus*, *Fregata minor*, *Oceanodroma tethys*, *Cregarus furcatus*, *Puffinus subalaris*) were sampled for breast feathers and analyzed for delta-15N and delta-13C isotope signatures and Hg content. These species encompass a broad range of life-history characteristics and diets, providing a framework for assessing food-web dynamics. Preliminary results indicate some species have shifted diets as predicted with the 2015 ENSO event while others show no impact. Additional sampling will be conducted in 2017.