

BOOK OF ABSTRACTS



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MECHANISMS OF EGG RECOGNITION IN BROWN-HEADED COWBIRD HOSTS: THE ROLE OF ULTRAVIOLET REFLECTANCE

The most effective adaptation against Brown-headed Cowbird *Molothrus ater* parasitism is rejection of the cowbird egg, yet relatively few hosts reject cowbird eggs. Studies have demonstrated that ultraviolet reflectance of eggs plays a role in egg rejection by hosts of the parasitic cuckoos, but the effects of ultraviolet light on rejection by cowbird hosts has largely been ignored. We measured the ultraviolet reflectance of the eggs of three rejecter species including the Brown Thrasher *Toxostoma rufum*, American Robin *Turdus migratorius*, and Gray Catbird *Dumetella carolinensis*. We also experimentally blocked the reflectance of ultraviolet light of one host egg in the clutches of these three rejecter species to determine whether they utilize ultraviolet light when rejecting eggs. We found that Brown Thrasher eggs reflected significantly more ultraviolet light than both American Robin and Gray Catbird eggs. Brown Thrashers were also significantly more likely to reject their own eggs that had the ultraviolet reflectance blocked compared to American Robins and Gray Catbirds. These findings suggest ultraviolet light is an additional factor that some hosts utilize when rejecting eggs. (6600)

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WINTER MERCURY EXPOSURE IN NEOTROPICAL MIGRANT SONG-BIRDS

Mercury (Hg) is a neurotoxin and endocrine disruptor that is increasingly globally distributed, including in tropical riparian areas. With this trend, migratory birds are more likely to be exposed to methylmercury on their wintering grounds; however, the extent of exposure and its effects are unknown. We collected 319 blood samples indicative of wintering ground mercury exposure from American Redstarts, Blackpoll Warblers, Black-throated Blue Warblers, Common Yellowthroats, Northern Waterthrushes, Ovenbirds, and Prairie Warblers in April and May 2009-2010 in Bill Baggs Cape Florida State Park on Key Biscayne, Florida. Northern Waterthrush had the highest blood Hg levels, averaging 0.25 ppm; American Redstarts and Ovenbirds were higher than average at 0.09 and 0.08 ppm Hg, respectively; and Blackpoll Warblers and Black-throated Blue Warblers had the lowest average Hg levels of species sampled. Winter habitat is thought to be a driver of these differences, but more data are needed to test this hypothesis. The effects of wintering mercury exposure could be seen throughout the annual cycle, and future work will focus on estimating the impact of mercury exposure during the migratory period. (6490)

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OCCUPANCY ANALYSIS OF SECRETIVE MARSH BIRDS IN THE KISSIMMEE CHAIN OF LAKES, FLORIDA

Populations of many species of secretive marsh birds are thought to be declining because of loss of marsh habitat. Lake restoration activities in the Kissimmee Chain of Lakes (KCOL) have impacted littoral habitats. In Feb-May 2009 and 2010, we conducted point counts in the KCOL using standardized North American Marsh Bird Monitoring Protocols and used robust design analysis to investigate factors influencing occupancy of King Rail (*Rallus elegans*), Least Bittern (*Ixobrychus exilis*), Purple Gallinule (*Porphyrio martinica*) and Limpkin (*Aramus guarauna*). Occupancy estimates of Least Bitterns were positively related to proportion of area cover by vegetation >75 cm. Occupancy of Purple Gallinules was positively related to the proportion of area with floating leaved vegetation and floating tussocks and Limpkin occupancy was related to percentage of area with emergent vegetation cover between 25-75%. King Rail occupancy was positively related to dense floating tussocks and vegetation cover >75%. Conserving for diverse assemblages of littoral habitats will support the greatest diversity of secretive marsh birds. (6380)

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SURVEYING FOR MICRONESIAN MEGAPODES USING A MULTIPLE METHOD APPROACH

The status of the endangered Micronesian megapode (*Megapodius laperouse*) in the Mariana archipelago was largely unknown due to the logistical and methodological constraints of surveying for rare species on remote islands. Here we report on 2010 surveys of seven islands which utilized a combination of point-transect, point-transect with playback, and occupancy sampling techniques. Sufficient megapode detections were recorded for four islands to estimate populations with traditional point-transect techniques, whereas estimates were derived for two islands utilizing a point-transect with playback technique which included a movement correction factor. Insufficient detections were recorded on the remaining island to derive a population estimate. A total population of over 10,000 megapodes was estimated with the larger populations on islands without feral ungulate populations. Islands without ungulate populations were also found to have 100% occupancy regardless of habitat composition while occupancy on islands with feral ungulates varied based on understory density and forest type. The application of all three survey techniques was successful and is expected to become the standard monitoring methodology for this species in the Mariana archipelago. (6478)

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SOME OF THE EFFECTIVE PARAMETERS FOR LITTLE GREEN BEE-EATER HABITAT SELECTION IN RIPARIAN ZONES OF MAROON RIVER AROUND THE BEHBAHAN CITY, IRAN

This study carried out in 2009 by observation methods in the basis of survey of density, observation and behaviour of Little Green Bee-eater *Merops orientalis* around of riparian zones of Maroon River. The maximum density of Little Green Bee-eater (*Merops orientalis*) individuals (53.8%) observed in cloudy conditions. 53.84% of them preferred 30-35 °C temperatures ranges. The most of them recorded in 16-17 and 18-19 hours duration. The most of them observed in groups with 2-3 individuals. 30.76% of them had 1-2 m distance from own individuals. 60% of them observed in flight time above the river. 47.69% of them had 1-2 m distance from vegetations. 60% of them observed 0-150 m distances from river marginal. (6385)

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STEROID HORMONE ANALYSIS OF ROOSTER SEMINAL PLASMA IN CONNECTION WITH SEMEN QUALITY CHARACTERISTICS

Much research has focused on identifying the presence and function of hormonal contributions passed along with gametes by female birds, but the hormonal content passed along with gametes by males continues to be relatively unexplored. In previous work, we found that avian semen contains quantifiable concentrations of reproductive steroids, and that progesterone, in particular, exists at high concentrations and exerts an inhibitory effect on the fertilization process. Such an effect could occur either through influences on sperm function or through a functional change in the hen. In the current study, we examined how concentrations of progesterone, as well as four other reproductive hormones (corticosterone, testosterone, dihydrotestosterone, and estradiol), relate to functional and morphological characteristics of sperm. Measures included sperm mobility, concentration, viability and morphology. Results will be discussed. Implications from this research provide insight to the function and potential adaptive value of steroid hormones in male reproduction. (6469)

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SPRING MIGRATION ECOLOGY OF AMERICAN BLACK DUCKS

American black ducks (*Anas rubripes*) have population declined over the last 50 years. Previous studies have addressed breeding and wintering ecology, but not the spring migration ecology of black ducks. During 2007–2009, we captured 68 black ducks in northeastern North America, and fitted them with satellite transmitters. We evaluated the relationship between departure date, number of and time spent on stopovers, and length of migration, among other migratory variables. Eastern migration corridors included the Atlantic Coast, Hudson River Valley, and St. Lawrence River; western included Lake St. Clair and St. Mary's River. Black ducks wintering along the Chesapeake and Delaware Bays migrated farther ($P=0.0029$), took more stopovers ($P=0.0223$), and despite an increased migration rate ($P=0.0272$), arrived later at nesting locations ($P=0.0405$) than those wintering farther north. Their delayed arrival was likely a result of the positive relationship between total length of migration and number of ($R^2=0.611$) and time spent on ($R^2=0.332$) stopovers. Analysis of habitat composition on stopovers is ongoing and will be used to develop a predictive model of habitat use specific to each Bird Conservation Region. (6418)

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THE ROLE OF SOCIAL CUES IN HABITAT SELECTION OF GRASSHOPPER SPARROWS

Many grassland birds exhibit relatively low site fidelity and therefore have to select new habitats in which to breed each year and possibly multiple times during a given year. Therefore, the habitat selection process of many grassland birds is likely to involve quickly evaluating habitats via a suite of cues. Previous research has suggested that one cue used by some grassland birds is the presence of conspecifics. We experimentally investigated whether Grasshopper Sparrows (*Ammodramus saviannarum*) use conspecific attraction when selecting breeding habitat in Central Illinois by using playback methods. We played songs of male Grasshopper Sparrows and compared abundances of Grasshopper Sparrows during breeding season between treatment ($N=6$) and control ($N=6$) sites. All sites had, that year, been converted from rowcrop agriculture and were enrolled in CRP. Nearly twice as many Grasshopper Sparrows were detected in fields with call boxes vs. control fields suggesting the presence of conspecifics could be important in the habitat selection process. Grassland species are experiencing significant population declines and understanding which habitats they prefer to breed in will be important in conservation planning. (6461)

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VARIATIONS ON BIRD RICHNESS AND COMPOSITION IN UNDISTURBED AND DISTURBED FOREST AREAS AT SOUTHERN BRAZIL

Richness and composition of bird communities were evaluated in 15 undisturbed Reserves of three types of Atlantic forests at southern Brazil during two years of field work, and compared with published data of forest fragments from rural (4) and urban (6) areas (i.e. gradient of urbanization). We recorded 269 bird species in those forests. Higher species number was found in the dense forest (138–157 species); seasonal forest and mixed forest presented respectively 97–121 and 89–125 species. Structure of the bird guilds did not differ significantly, although significant differences in richness and composition of those undisturbed forests. Lower species number was found in rural (73–106 species) and urban (11–66 species) fragments. The trophic structures, in relation to undisturbed forests, differed significantly only for the urban fragments. Omnivores, gleaning insectivores, and small frugivores were the guilds more affected by the gradient of urbanization. Forest omnivores may shift their diets and increase their home ranges and then could survive more efficiently than other trophic guilds in different types of undisturbed forests; but, in limited areas, as fragments, such abilities are probably less useful. (6373)

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PHYLOGEOGRAPHIC AND POSSIBLE INDIAN SUBCONTINENT ORIGIN OF ESTRILID FINCHES (PASSERIFORMES) FROM AFRICA, SOUTH ASIA AND AUSTRALIA.

Estrildid finches are distributed throughout Africa, South Asia, Australia and Indian and Pacific Ocean islands. This study has analysed 64 species of estrildids through cytochrome b DNA sequencing and Bayesian Inference. Estrildids are a monophyletic group with polytomies that may have started evolving by Middle Miocene Epoch (about 16.5 MYA). This date is coincidental with the Fringillinae finches' radiation starting time and also with the biggest Himalayan and Tibetan Plateau uplift. The most basal estrildid clade comprises African, Indian and Australian birds, suggesting that the whole estrildids radiation might have originated around India. It is shown that: 1) Gouldian Finch (*Chloebia / Erythrura gouldiae*) is definitively included within genus *Erythrura*, 2) the oldest Estrildinae evolutive radiation group seems to be the African silverbill (*Lonchura cantans*), together with Indian silverbill (*Lonchura malabarica*), and the phenetically distinct Diamond Firetail (*Stagonopleura guttata*) from Australia, 3) the Java sparrow (*Padda / Lonchura oryzivora*) is a *Lonchura* species, 4) African munias ("Spermestes") form a distinct phylogenetic cluster (within genus *Lonchura*) with respect to Asian and Australian munias. Ref: Open Ornithology Journal 2:29-36 (2008). (6485)

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PHYLOGENETIC DESCRIPTION OF THE THREE NORTH AMERICAN CARDUELIS RADIATIONS

Three North American *Carduelis* radiations have been identified. Eurasian siskin (*C. spinus*, Eurasia) could be the ancestor of all American *Carduelis* finches, being an example of adaptive radiation caused by a North - South migration barrier (glaciations) and provincialism of isolates. 1- Pine siskin radiation comprises siskin, Antillean siskin, black-capped siskin, pine siskin and pine siskin perplexus. *C. spinus* could have passed to America through the Beringia or Greenland coast. During Pliocene Epoch, *C. spinus* reached the Antilles and evolved into Antillean siskin (*C. dominicensis*), endemic to Hispaniola Island. It could be ancestor of pine siskin. Pine siskin, a sister taxon of *C. spinus*, thrives in North America from Alaska to Guatemala since about 0.2 Black-capped siskin (*C. atriceps*) is a "sister" species of *C. pinus*. 2- North American goldfinch radiation includes *C. tristis* (American goldfinch), *C. psaltria* (lesser goldfinch), and *C. lawrencei* (Lawrence's goldfinch). They all thrive in western United States and Mexico, down to northern South America. *C. psaltria* is a North American bird that colonized South American habitats and evolved into darker head and back. 3- South American siskin radiation. Parental *C. notata* thrives in Mexican mountains and successfully colonized South America about 3 MYA, giving rise to this radiation. (6426)

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SONGBIRDS CONSERVED SITES OF MHC CLASS I MOLECULES REVEAL A UNIQUE EVOLUTION IN VERTEBRATES, INCLUDING OTHER BIRDS

Birds are considered dinosaurs that passed the 65 million years ago bottleneck. Songbirds (Passeriformes) included about half extant bird species (about 5000) and are general the most air-thriving bird species, particularly in conjunction with their small size. Major Histocompatibility complex (MHC) molecules stimulate immune responses against microbes and its class I molecules has seven conserved residues in all vertebrates from jawed-fishes, 300 million years ago, to humans, including chickens. All wild songbird species tested by us (n=18) and others (n=2) differ in $\alpha 1$ domain residue 10 and $\alpha 2$ residue 96 from all other vertebrates. Crystallographic studies were performed and showed that these changes did not significantly vary the MHC class I molecule entropy in songbirds. Further $\alpha 1$ and $\alpha 2$ domain comparisons by simple Composition Distances and Bayesian Inference showed that songbirds overall MHC class I molecules are phylogenetically more separated from mammal and other birds molecules. Passeriformes dinosaur lineage has undergone a different MHC evolutive pathway. (6494)

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APPARENT SURVIVAL OF MALES WITH ALTERNATIVE MATING STRATEGIES

Natural selection predicts that males benefit from obtaining multiple mates; however, mate-guarding and brood-rearing costs may negate any evolutionary advantage. House Wrens *Troglodytes aedon* are typically monogamous, but sequential monogamy (2 non-overlapping broods) and polygyny (2+ broods active simultaneously) are common. We tested two exclusive hypotheses: 1. According to the 'cost of reproduction' hypothesis, multi-brooded males would have reduced survival because they expend more energy for reproduction and less toward physical maintenance. 2. According to the 'good genes' hypothesis, multi-brooded males would have high survival due to their high genetic quality, which may correlate with immune ability. Using 5 years of banding and nest box monitoring data, we used multi-state mark-recapture models to estimate the survival and transition probabilities of single-brooded and multi-brooded males. We found no difference in the apparent survival rates of males based on their mating system. Additionally, estimates of transition probabilities encompassed zero, so males were unlikely to transition between single-brooded and multi-brooded states. Our results do not support either hypothesis, suggesting that genetic quality or environmental conditions may influence male mating strategy and survival independently. (6586)

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CHARACTERIZATION OF THE SEMI-VOLATILE COMPOUNDS OF UROPYGIAL GLAND SECRETIONS OF THREE AVIAN RESERVOIR HOSTS OF WEST NILE VIRUS

The uropygial gland of birds produces secretions that are important in maintaining the health and structural integrity of feathers. These secretions are also believed to be used by arthropods, including mosquitoes, as cues to locate birds. We hypothesized that the secretions contribute to the observed feeding preference of *Charadrius melodus* *Culex pipiens* *Charadrius melodus*, an important West Nile virus mosquito vector, for American Robins over European Starlings and House Sparrows, as well as for adult House Sparrows over nestlings. We compared the

volatile and semi-volatile components of the secretions among the three species and among House Sparrow age groups. We found that the composition of robin secretions varied considerably from those of the sparrows and starlings in having a prominent alcohol, a diester, and very few other semi-volatile compounds. In the later two species we primarily found a diverse mixture of semi-volatile esters with complex branching patterns in the semi-volatile region. Although we observed no sex-related differences in the types of compounds produced by House Sparrows, we did find quantitative differences between older birds and nestlings. (6536)

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BIOLOGY OF MONK PARAKEETS IN SOUTH FLORIDA

Formerly imported by the thousands for the pet trade, monk parakeets (*Myiopsitta monachus*) have been in Florida for over 40 years. Although this conspicuous, charismatic species is now widely established, relatively little is known about its population biology outside South America. From nest removals and collections made by utility company personnel during maintenance operations in 2003 and 2004, we examined over 700 parakeets to document body size, reproductive biology, and molt. Consistent with previous genetic analyses, body measurements confirm that south Florida birds belong to the monachus subspecies. The breeding season commences in late winter/early spring, and the onset of remige molt coincides with the end of egg-laying in early April. During June-August, over 94% of the adults birds we examined were replacing primary feathers. The extent and timing of breeding and molt in south Florida are virtually identical to those in South America, although offset by approximately 6 months. While parakeets in south Florida retain a fixed annual cycle characteristic of the ancestral population, their flexible behavior enables them to adapt and thrive in new environments. (6429)

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WHERE ARE THE BUGS? INVERTEBRATE FORAGE FOR MIGRATING SHOREBIRDS IN SOUTHEAST ARKANSAS

During migration, the average 45 gram shorebird needs to eat approximately 8 grams of invertebrates per day. While shorebird stopover habitat guidelines for the Lower Mississippi Alluvial Valley are based on an estimate of 2 grams of invertebrate forage per square meter, this figure has not been quantified in Arkansas. As part of a larger study on shorebird stopover use in Southeast Arkansas, we are attempting to quantify available invertebrate forage on three properties (Bob White Memorial Wetlands, a permanent Wetland Reserve Program Easement; Halowell Reservoir, part of Bayou Meto Wildlife Management Area; and the Wrape Plantation, also part of Bayou Meto Wildlife Management Area) each experiencing different moist soil and shorebird management intensities. Over eight weeks of sampling (N=32), a season average of 1.46 grams (0.92 with one outlier removed) of invertebrates per square meter was available for migrating shorebirds on the Bob White Memorial Wetlands. Analysis of samples from Halowell Reservoir and the Wrape Plantation are ongoing. Preliminary results suggest that availability of invertebrate forage during the fall migration period may be lower than previously estimated. (6435)

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GOLDEN-WINGED WARBLER RESPONSE TO TIMBER HARVESTS IN PENNSYLVANIA.

The Golden-winged Warbler *Vermivora chrysoptera* is a migratory songbird that has recently been petitioned for listing under the Endangered Species Act. As such, the development of management prescriptions that create Golden-winged Warbler breeding habitat is a conservation priority. In 2010-2011, we surveyed approximately 300 timber harvest stands using distance-based point counts to document presence and density of Golden-winged Warblers. We then sampled the landscape and local habitat features and modeled which of these factors best explained response of Golden-winged Warblers to create a BMP (best manage-

ment practices) for land managers. Namely, this BMP highlights the importance of forest cover, elevation, nearby disturbances, and a forested edge. Indeed, stands with the highest densities (>2 males per point) had an average of 79% forest cover within 1km of the stand. At a smaller scale, we emphasize the need for retaining residual trees, and varying amounts of shrubs, saplings, and herbaceous plants. Golden-winged Warbler density peaked at 40 ft²/acre of residual basal area (RBA) where densities were 2 and 3 times higher than when RBA was 50 ft²/acre, respectively. (6598)

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PROFILING THE TRANSCRIPTIONAL RESPONSE TO SONG PLAYBACKS WITH RNA-SEQ

Zebra finches (*Taeniopygia guttata*), a colonial passerine bird species, communicate via a repertoire of vocalizations. Each male sings a distinctive song that females use to choose and recognize their mate within the colony. Individual songs are processed and learned using a composite forebrain region termed the Auditory Lobule (AL). Previous studies of male zebra finches showed that exposure to song induces long-lasting gene expression changes in the AL. We tested the hypothesis that female zebra finches, the typical target of male courtship song, would respond differentially to playbacks of "novel" versus "familiar" songs. We used Illumina RNAseq technology to profile the gene expression patterns in the AL. Using this approach we were able to quantify gene expression in approximately 80% of zebra finch Ensembl genes across experimental conditions. We also detected expression of numerous previously uncharacterized transcripts and isoforms. RNAseq results suggested differential gene expression in a number of genes not previously known to be song responsive. These regulated genes include major histocompatibility (MHC) class I genes, suggesting a possible role for immune signaling in song recognition. (6636)

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PATTERNS OF MORPHOLOGICAL VARIATION ACROSS AN AVIAN HYBRID ZONE: IMPLICATIONS FOR THE SPECIATION PROCESS

Hybrid zones between recently diverged taxa provide a unique opportunity to study the early stages of speciation. Of particular interest is what selective forces may cause phenotypic divergence. We quantified variation in a suite of morphometric and plumage characteristics across a hybrid zone between two subspecies of the red-backed fairy-wren (*Malurus melanocephalus*) in Australia. We then tested for associations between individual traits and environmental variables using generalized dissimilarity models. As we predicted, variation in morphometric traits such as body weight, tarsus length, etc., was strongly associated with environmental variation, suggesting a role for ecological selection in shaping these traits. In contrast, variation in plumage color was better explained by geographic distance, independent of environmental variation. This pattern is consistent with divergent sexual selection or drift. Together these results suggest that different forms of selection have acted concurrently to cause the subspecies to diverge. They also highlight the importance of analyzing phenotypic divergence along many axes. Behavioral experiments are necessary to separate the effects of sexual selection and drift on divergence in plumage. (6372)

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LONG-TERM CHANGES IN THE BREEDING POPULATION OF BALD EAGLES IN FLORIDA BAY, EVERGLADES NATIONAL PARK, USA.

Florida currently supports ~11% of the nesting Bald Eagle (*Haliaeetus leucocephalus*) population in the lower 48 and underwent a dramatic recovery, increasing >300% past 25 years. However, at the southeastern extreme of its range

in Florida Bay, the population has not followed this upward trend. Beginning in the late 1980's, Florida Bay began a series of dramatic hydrologic and ecological changes due to altered freshwater inflows and we document a downward trend in bald eagle breeding from a dynamically stable breeding population considered to be at carrying capacity (30 historic territories). In comparison with the highest five-year occupancy period of the study (1972-1976; mean occupied territories 26.8+0.83SD), the last five year period (2005-2009; mean occupied territories 16.8+1.30SD) represents a 37% decrease. Total annual production (16.7+4.14SD) and annual brood size (1.47+0.15SD) appear steady while reproductive rate (young/occupied: 1972-76: 0.63+0.11SD; 2005-09: 0.94+0.11SD) increases in part due to the loss of occupied territories. Changes from historical benchmarks have led us to examine the relationship of Bald Eagle territory location, occupancy, nesting activity, nesting success, and productivity in Florida Bay from 1958-2009. (6539)

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PLUMAGE COLOR PREDICTS PATHOGEN-INDUCED GENE EXPRESSION IN A WILD BIRD

The good genes hypothesis proposes that ornamental traits reflect the genetic quality of individuals. In the house finch, plumage color is important in mate choice and is linked to parasitism. Male house finches infected with *Mycoplasma gallisepticum* (MG) grow feathers that are yellower than males that are not infected, and males that have redder plumage prior to infection clear disease symptoms faster than yellow birds. To investigate the relationship between genetic quality and male color, we infected wild birds from a naive population with MG. Using a cDNA microarray, we compared transcriptional profiles of uninfected controls to yellow and red infected individuals. We found that several genes involved in immune responsiveness, including MHC class II invariant chain, galectin-2, and T-cell receptor beta chain, were significantly down-regulated in yellow but not red birds relative to controls. MG is known to be immuno-suppressive and down regulation in yellow but not red birds suggests that red birds are less susceptible to negative effects of MG. This study supports the predictions of the good genes hypothesis, but heritable disease resistance remains to be demonstrated. (6363)

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EARLY LIFE ENVIRONMENT INFLUENCES MATERNALLY DERIVED YOLK ANDROGENS AND ADULT REPRODUCTIVE PHENOTYPE IN A COOPERATIVELY BREEDING BIRD

Ecologists generally conduct research in two interrelated but discrete areas: the influence of early life conditions on offspring quality and the role of adult phenotype on fitness. In this study we reveal a critical link between these periods in Red-backed Fairy-wrens (*Malurus melanocephalus*) and suggest a mechanistic basis for this association. First year males in this species adopt one of three testosterone dependent reproductive phenotypes; they can either breed in red/black plumage or brown plumage, or remain as non-breeding brown natal auxiliaries. We tested the hypothesis that first year phenotype reflects variation in early life conditions by investigating the impact of parent age, fledge date, natal auxiliary presence, nestling body condition, and number of siblings on adult phenotype. Red/black breeders fledged earlier, were much less likely to have natal auxiliaries, and came from territories with more siblings. Furthermore, yolk testosterone levels were higher in the absence of natal auxiliaries, suggesting associated environmental influences on maternal effects. This research implies that developmental environment, rather than 'good genes', may be driving variation in first year breeding phenotype and thus adult fitness. (6366)

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REGIONAL CLIMATE CONDITIONS AND VARIATION IN MIGRATION TIMING IN NORTHERN CALIFORNIA

Climate change has impacted seasonal phenology and geographic distributions of plants and animals. Regional effects of El Niño Southern Oscillation (MEI), North Atlantic Oscillation (NAO) or Pacific/North American (PNA) seem to be associated with climate change. Migration timing has been associated with NAO and MEI in Europe and eastern North America, but rarely examined on the Pacific coast. Based on a 22-year mark-recapture dataset collected in northern California, we assessed variation in the timing of arrival associated with climate indices during spring and fall migration for five species of migratory songbirds. Avian responses to climate indices were heterogeneous. During spring, timing of migration was associated with three indices in three species and two indices in two species. During fall, timing of migration was associated with two indices in one species and one index in four species. In future analyses, we will assess long-term variation in stopover duration and whether it is associated with variation in climate indices. (6612)

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DISTRIBUTION OF BREEDING BIRD SPECIES ALONG THE ELEVATIONAL GRADIENT IN THE CENTRAL HIMALAYA

We investigated breeding bird species throughout their distribution range from 100m to 6000m a.s.l. based on interpolation of published database. Interpolation result showed a unimodal distribution pattern peak at 1200m and a plateau from 1700m to 2200m. The plateau was tested by investigating breeding bird species in each 100m elevational gradients from 1500m to 2400m a.s.l. in four different mountains. In total, 6,522 individual of birds belonging to eight orders, 23 families, 77 genera and 146 species were recorded. The main variation in species composition corresponded to the altitude, canopy and slope. In case of feeding mode, altitude showed positive correlation with nectarivorous guilds ($r = 0.44$), but strong negative correlation with frugivores ($r = -0.72$). Species richness was higher at lower elevations and relatively uniform up to the elevation of 2200m and then it declined significantly with increasing altitude. We found that there were no changes in species richness with increasing altitudinal gradients from 1700m to 2200m. The general trend of distribution of species in the Mahabharat Mountains with a plateau from 1700m to 2200m is unique. (6635)

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CONTRASTING PATTERNS OF GENETIC DIFFERENTIATION IN ALBERTINE RIFT BIRDS AND POTENTIAL CAUSES

Data from mitochondrial DNA sequences for three endemic Albertine Rift avian lineages: Red-chested Alethe, Alethe poliophrys; Grauer's Rush Warbler (*Bradypterus graueri*), and populations of African Hill Babbler (*Psuedalcippe abyssinica*) show markedly different breaks across the Albertine Rift, which has been separated into seven major landscape blocks. We date nodes and use other analytical approaches to try to understand the underlying causes of these differences that could include different histories of movements into/across the region and responses to different historical events. (6650)

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THE EFFECTS OF GENETIC HITCH-HIKING ON INTRON POLYMORPHISMS IN ANAS DUCKS

Introns are increasingly being used in population genetics and phylogenetics because their substitutions are presumed to be effectively neutral. However, growing evidence suggests that selection can influence intron polymorphisms and thereby bias inferences of evolutionary histories. In this study, we tested whether selection has a direct effect on introns or an indirect effect resulting from physical linkage to protein-coding exons (i.e., genetic hitch-hiking). We sequenced the exons flanking ten introns that appear to be under different selective pressures for 30 species of ducks from the genus *Anas*. We predicted that if selection acts indirectly on introns, then nucleotide diversity within introns will be correlated with amino acid replacements within the flanking exons. In contrast, if selection has a direct effect, then intron diversity will be independent of exon diversity. We found a positive correlation between intron diversity and non-synonymous diversity within exons ($R^2 = 0.54$, $P = 0.016$), suggesting that selection has had an indirect effect on intron polymorphisms. These results suggest that we need to account for selection when using introns to study the evolutionary histories of species. (6475)

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GENETIC AND MORPHOMETRIC VARIABILITY IN GENERALIST AND SPECIALIST SPECIES OF SOUTH AMERICAN SISKINS

Generalist and specialist species differ in phenotypic and genetic variability as well as vulnerability to extinction. However, it is unknown whether loss of variation is caused by small population size, resulting in ecological specialization, or if variation is lost as a consequence of natural selection and specialization. To address this question, we examined genetic diversity and morphometric variation among four sympatric siskin species with large populations in the Andes (genus: *Carduelis*). Three of these species are high-altitude habitat specialists (*C. atrata*, *C. crassirostris* and *C. uropygialis*) while the fourth, *C. magellanica*, is a widespread generalist present from lowlands to Andean treeline. Using a q-mode principal component analysis, I found that the covariance of morphometric traits among *C. magellanica* individuals differed significantly from the three other species. Mitochondrial genetic diversity was greater in *C. magellanica* than in its congeners. Neither the morphometric or genetic variation showed strong geographic structure across the range of *C. magellanica*, with high variation maintained within local populations. These results suggest that maintenance of genetic variation in *C. magellanica* facilitates ecological flexibility. (6611)

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CLIMATE EXPLAINS THE DISCORDANCE BETWEEN MORPHOLOGICAL AND GENETIC VARIATION IN THE HUMMINGBIRD, METALLURA TYRIANTHINA

Geographic isolation and diversifying selection have been implicated in diversification. Intraspecific patterns of variation can illustrate the relative importance of these mechanisms. The Andean hummingbird, *Metallura tyriantithina*, is phenotypically diverse and occurs in a variety of environments across its broad distribution. We examined the extent to which geographic distance and climate explain patterns of morphological and genetic diversity. Linear regression analysis of bill length as a function of climate revealed a strong relationship with longer billed birds existing in drier environments and shorter billed birds in wetter environments, regardless of geographic proximity or subspecies. Bill length even increases from wet to dry environments within a single subspecies across short distances (<20 km). This ecomorphological variation is independent of mtDNA phylogeographic structure in which long-billed birds from western Andean slopes and rainshadowed valleys are intermingled with short-billed birds from the humid east-facing slopes. In *Metallura tyriantithina*, geographical isolation has driven genetic divergence with ecomorphological stasis, but climatic differences are associated with an abrupt bill-size shift that is likely robust to ongoing gene flow. (6606)

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THE RISE AND FALL OF AN ADAPTIVE RADIATION

I will discuss the ecological and evolutionary processes contributing to both divergent selection between crossbill populations and reproductive isolation (speciation) between call types of Red Crossbills (*Loxia curvirostra* complex). Much of the diversification of crossbills is the result of divergent selection for foraging on alternative conifers, however, coevolutionary arms races between crossbills and conifers are also important processes contributing to crossbill diversity. Speciation may occur readily in crossbills once populations begin to adapt to alternative resources, with assortative flocking by phenotypes perhaps representing a critical process for reproductive isolation between widely sympatric populations. I will end by discussing the environmental conditions that may have contributed to the origin of crossbills, and use this to address why crossbills, especially the South Hills crossbill, are declining so rapidly (6633)

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FORAGING MODE PREDICTS INTERSPECIFIC VARIATION IN SINGING BEHAVIOR AND DETECTION PROBABILITY OF BOTTOMLAND FOREST WARBLERS

Numerous factors affect singing behavior in birds. Despite considerable attention on intraspecific variation in song rates, there has been less focus on interspecific variation. Life-history differences among species may affect the amount of time that is devoted to singing vs. other activities. For example, species that are dependent on patchily distributed foraging substrates may spend more time searching for food and, consequently, less time singing. To examine this, I studied habitat structure, singing behavior, and detection probability of five species of wood warblers breeding in bottomland hardwood forests: Hooded Warbler (*Wilsonia citrina*), Kentucky Warbler (*Oporornis formosus*), Northern Parula (*Parula americana*), Prothonotary Warbler (*Protonotaria citrea*), and Swainson's Warbler (*Limothlypis swainsonii*). Leaf litter and understory vegetation was more patchily distributed than subcanopy and canopy foliage. Accordingly, singing rate and detection probability increased from species that forage on or close to the ground to those that primarily forage higher in the understory, midstory, or overstory. Beyond having implications for life-history strategies, these results have consequences for the efficiency of monitoring programs, especially for species that are dependent on patchily distributed resources. (6590)

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A NATIVE PLANT BECOMES INVASIVE: WINTERING GRASSLAND BIRDS RESPOND TO INCREASED *HETEROPOGON CONTORTUS*

Tanglehead *Heteropogon contortus* is considered a native bunchgrass that has recently increased in distribution and dominance in south Texas grasslands, behaving like an invasive species. We sought to quantify the effects of this change on wintering birds. We selected 70 plots along a gradient of tanglehead dominance (0-70%), where we surveyed birds along 250-m line transects and vegetation in 0.25-m² quadrats (n = 17/plot) in winter 2010 and 2011. Vegetation structure and composition changed along the tanglehead gradient; for example, native grass cover decreased 82 and 75% in 2010 and 2011 (95% CI = -90--75%, -92--67%). Presence of Eastern Meadowlark increased 43% in 2010 but decreased 98% in 2011 (-35-216, -100--48%) across the gradient. Similarly, presence of Cassin's Sparrow increased 2308% in 2010 and decreased 98% in 2011 (49-14625, -100--60%) across the gradient. Grasshopper Sparrow and Western Meadowlark showed similar trends; presence increased with tanglehead in 2010 and decreased in 2011. Precipitation differed greatly in the two years - extreme drought followed by substantial rainfall. Avian response to the increase in tanglehead dominance seems to depend upon drought conditions. (6525)

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MULTI-LOCUS EVIDENCE OF A LATE PLEISTOCENE DIVERGENCE IN NORTH AMERICAN WOOD DUCK (AIX SPONSA)

The Pleistocene was characterized by fluctuations in climate causing repeated advances and retreats of glacial ice. The advancing ice sheets caused habitat fragmentation which initiated population divergence and speciation events between eastern and western populations within northern temperate forests. Based on mitochondrial DNA (mtDNA) control regions, North American Wood Duck (*Aix sponsa*) populations fit this model of divergence. However, mtDNA is maternally inherited, and thus may not reflect the genomic history of this species, because of male biased-dispersal. To test the "Late Pleistocene divergence" hypothesis, we sequenced 11 independent nuclear introns (nuDNA) for 45 individuals sampled from eastern and western populations of Wood Ducks. Although 4 loci were significantly structured between East and West, overall population structure was considerably weaker for nuDNA (mean F_{ST} = 0.032; range = 0.0 to 0.0174 to 0.059) than for mtDNA (F_{ST} = 0.31). However, estimates of time since divergence from both nuDNA and mtDNA are consistent with the last glacial advance splitting the two populations. (6450)

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CAUSES OF LEAD-PELLET INGESTION BY CHUKARS IN WESTERN UTAH

Although chukars (*Alectoris chukar*) have been documented to ingest lead pellets, the causes are poorly understood. We assessed the influence of feeding behaviors, lead density, and habitat use on lead-pellet ingestion by captive and wild chukars. Search images for lead-mimicking foods and increased lead-pellet density resulted in captive chukars voluntarily ingesting more lead. All Indian ricegrass seeds (*Stipa hymenoides*) and nearly 1/3 of grit pebbles removed from the digestive tract of wild chukars were consistent with the popular lead-birdshot sizes 4-9. We found more lead pellets in soils near springs vs. guzzlers or reference points. We observed a significant negative relationship between liver-lead concentrations in collected chukars and linear distance of harvest location from springs or guzzlers, but not roads. Ranked values for liver lead were significantly greater for individuals collected near vs. far from springs. Chukars and sympatric mourning doves in western Utah are at high risk for increased lead exposure and its concomitant effects. Although hunting is a viable management and conservation tool, preventable poisoning of protected wildlife species by lead ammunition is an unnecessary form of mortality (6614)

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CONSEQUENCES OF LEAD-PELLET INGESTION BY CAPTIVE CHUKARS

Although wild chukars (*Alectoris chukar*) ingest lead pellets, the consequences of this ingestion are purely speculative. We investigated the consequences of ingested lead pellets on captive chukars as a function of lead weathering, diet type, and wild onion (*Allium* spp.) supplementation. We documented 7 mortalities and 10 separate morbidities in chukars dosed with # 6 lead pellets. As few as one lead pellet induced morbidity and death. Tibia-lead concentrations were positively correlated with lead retention and negatively related to age. Approximately 2/3 of all lead-dosed birds retained lead for the trial duration. Weathered lead pellets were more frequently retained. Lead-dosed individuals fed a mixed seed diet perished more frequently and gained significantly less weight than those fed a commercial pellet diet. Wild onion supplementation had positive benefits on weight gain and survival in juveniles and adults. A mixed-seed diet and lead weathering exacerbated the effects of lead. Wild chukars consuming wild onion may be benefitted against the consequences of lead toxicosis. Research assessing the effects of lead-pellet ingestion on wild chukars is essential to properly manage this pressing issue. (6615)

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VARIATION IN CAVITY-NESTING BIRD DENSITIES ACROSS TWO FIRE-MAINTAINED LONGLEAF PINE FORESTS AND IMPLICATIONS FOR FACTORS LIMITING THEIR POPULATIONS

Cavity-nesting birds have experienced population declines in recent decades and their conservation will require an understanding of factors limiting their populations. Nest sites are often considered the primary factor limiting cavity-nester densities. We studied the nesting ecology of cavity-nesting birds in two longleaf pine forests in Florida (old-growth) and North Carolina (older second growth), both reflecting similar management regimes. We documented cavity-nests ($n = 103$) and snag availability at both sites using identical protocols. Species richness ($S = 9$ and 8), snag densities (9.6 and 8.7 snags/ha, $P = 0.61$), and proportional use of tree type for nesting were similar at both sites. However, nesting density at the old-growth forest was half that of the second-growth forest (0.17 vs. 0.34 nests/ha, $P = 0.008$). We observed no qualitative differences in available snags across sites, suggesting that neither snag quantity nor quality was limiting cavity-nester populations in the old-growth forest. We hypothesize that greater ecosystem productivity and heterogeneous habitat, which may lead to a more abundant and diverse food source, might explain the higher nesting densities at the second-growth site. (6482)

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QUANTITY DISCRIMINATION IN JUNGLE CROWS, *CORVUS MACRO-RHYNCHOS*

We investigated preference of jungle crows ($N = 8$) to select a given quantity (five items) when simultaneously presented with smaller (three and four) or larger (six, seven and eight) novel quantities following training. Crows that reached discrimination criterion (15 out of 20 correct choices, two-tailed binomial probability test, $P < 0.05$), next received control and novel quantity tests. Crows learnt the discrimination task of 2 versus 5 quantities relatively quickly during training. In addition, their performance was not controlled by the non numerical cues such as stimuli configuration, shape, colour, size or total filled area, indicating that the crows were responding to quantity. Additionally, crows selected the familiar larger quantity (five) when presented with smaller novel quantities (3 versus 5 and 4 versus 5). However, they selected the larger novel quantities over the familiar smaller quantity (five) in larger comparison sets (5 versus 7 and 5 versus 8). Overall, crows selected the larger of the two quantities presented except that of 5 versus 6, the set with the largest numerical ratio indicating the use of analogue magnitude mechanism for numerical judgment, as is reported in other animals. (6375)

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ARE PREDATORS EATING AWAY AT GENETIC DIVERSITY IN SONG SPARROW POPULATIONS?

Island populations are typically less genetically diverse than their mainland counterparts, primarily due to increased isolation leading to decreased dispersal. However, in the Gulf Islands of Western Canada, physical dispersal barriers alone are not able to explain the variation in genetic diversity amongst song sparrow (*Melospiza melodia*) populations. These island populations range from highly inbred to highly heterozygous, though they are only a few kilometres apart. We used 17 microsatellite loci to test the hypothesis that patterns in genetic diversity may be driven by variation in predation pressure. We report the surprising result that Gulf Island sparrow populations are more genetically diverse than those inhabiting the Vancouver Island 'mainland' and find a correlation between genetic diversity and predation pressure. Lower heterozygosity on the mainland occurred despite clear evidence of immigration into these populations, which lends further support to the idea that ecological factors rather than physical barriers are at play. We conclude that predation pressure affects population genetic structure and genetic diversity in prey populations and our continuing investigations will determine precisely how predation can generate these effects. (6355)

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DEVELOPMENT OF A TERRITORIAL OCCUPANCY MODEL FOR BALD EAGLES, *HALIAEETUS LEUCOCEPHALUS*, IN FLORIDA BAY, EVERGLADES NATIONAL PARK

Bald eagles in Florida Bay, ENP have undergone a recent shift in territory occupancy patterns, despite a historically stable population. Using field data collected annually since 1958, a Markovian simulation model was developed to explore territorial occupancy dynamics. In any given year a territory can be in only one of the following four states: unoccupied, occupied (adults present but not breeding), active (adults present and breeding), or successful (adults present and young successfully fledged). Transition matrices were built based on the probability of occupying any of the four states over subsequent years. The stable state distribution (SSD) is independent of the initial territory occupancy. Territories with high turnover probabilities approach a SSD in less time than territories with lower turnover probabilities. The model establishes relative importance to transition probabilities that increase the overall number of successful territories, provides useful insight into the effect stochastic and anthropogenic events may have had, and can be used to simulate scenarios to help direct ongoing management actions. (6592)

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DIVERGENT COURTSHIP BEHAVIORS AND INTERMEDIATE WING SOUNDS OF THE STRIPED MANAKIN (*MACHAEROPTERUS REGULUS*)

Together with *Machaeropterus pyrocephalus*, *M. regulus* is the sister taxa of the unique wing-singing, resonant-feather toting, and solid wing-boned Club-winged Manakin, *M. deliciosus*. The Striped Manakin is poorly known, and seems to be rare wherever it is encountered. A population of *M. regulus* was studied for 6 weeks in Tiputini Biodiversity Station, Ecuador in 2010. The territories of two male *M. regulus* were found, defined, observed and display behaviors recorded and compared to those of closely-related *Pipra* and *Machaeropterus*. Relative to the clade from which it was derived, *M. regulus* have simple, subtle, call-like vocal "songs", large territories, and tiny terrestrial display courts. Males visit courts infrequently and perform quiet but complex displays that include unique wing-sounds. Videos of courtship displays are shown. *M. regulus*'s behavioral and morphological synapomorphies with *Pipra*/*Machaeropterus*, intermediates to *M. deliciosus*, and apparent evolutionary novelties are analyzed and discussed. (6640)

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THE CURRENT STATE OF FLORIDA'S ONLY ENDEMIC BIRD ON CONSERVATION LANDS

Habitat loss and fragmentation of Florida's oak scrub habitat has resulted in smaller and increasingly isolated populations of the Florida Scrub-Jay (*Aphelocoma coerulescens*). Florida Scrub-Jays are dependent on frequently burned scrub, but prescribed fire is often at odds with surrounding human land uses. A survey of scrub-jays in 1992-1993 concluded that populations had declined by more than 40% from the previous decade. As a consequence, acquisition and protection of scrubs became a priority and 198 sites are currently under conservation management. Because no subsequent statewide survey of scrub-jay populations existed, in 2009-2010, we compiled surveys conducted by others and undertook our own surveys to examine population trends since 1992-93. We estimated habitat and jay carrying capacity for all sites. Despite the increase in protected lands, scrub-jay populations declined by more than 20%. The current population of 1253 groups on managed lands is less than half the potential carrying capacity of 3094 groups. Continued declines and the frequency of populations below carrying capacity on conservation lands are due to inadequate fire management. Increased fire management is critical for the species survival. (6409)

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POTENTIAL CARRY-OVER EFFECT BETWEEN MIGRATION AND BREEDING IN A SMALL PASSERINE

Carry-over effects are challenging to study in small migrants because it is difficult to follow individuals throughout an entire year. Here we present evidence of a potential carry-over effect between migration and breeding in a short-distance migratory passerine, the mountain white-crowned sparrow (*Zonotrichia leucophrys oriantha*). Pointed wingtips decrease energy expenditure during migratory flight, potentially allowing individuals to arrive earlier and/or in better condition than conspecifics. To test these hypotheses, we caught individuals as they arrived at a high-altitude breeding site and measured wingtip shape, fat scores, and corticosterone levels. We found that both males and females that arrived earlier in the season had more pointed wingtips than individuals that arrived later, consistent with the idea that these birds migrated faster than individuals with rounded wings. This effect was independent of age. In small passerines, individuals that arrive earlier in the season tend to have higher fitness than conspecifics. Thus, we have found a potential link between migration performance and a fitness proxy in a small passerine migrant, suggesting a mechanism by which adaptations that reduce migratory flight costs could evolve. (6570)

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URBANIZATION AND THE DYNAMICS OF DECLINE AND RECOVERY OF THE FLORIDA SCRUB-JAY

In the early 1990s, at least 30% of all Florida Scrub-Jay (*Aphelocoma coerulescens*) populations occurred within a suburban matrix. Access to abundant, predictable, and relatively high quality human-provided foods resulted in higher densities, earlier breeding, larger clutches, and increased reproductive effort by suburban birds. However, arthropod abundance is lower in suburban than wildland habitats and human-provided foods, mostly of plant origin (seeds, nuts, breads) are inappropriate foods for raising nestlings. As a result, brood reduction and post-fledging mortality is higher and suburban birds are unable to raise enough young to offset adult deaths. Consequently, suburban scrub-jay populations have declined by 50-100% since the 1990s. Wildland jays rarely emigrate to suburbs, but suburban birds readily disperse to and settle in wildlands. Scrub-jay populations at several sites where scrub vegetation was restored have grown as a result of immigration from nearby suburbs. Restoration of potentially suitable but unoccupied sites within dispersal distance of suburban populations should be a high conservation priority and may provide an opportunity to offset the inevitable loss of jay populations in suburban habitats. (6439)

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LEKING BIRDS IN A TROPICAL FOREST FOREGO SEX FOR MIGRATION,

Facultative partially migratory animals provide a contemporary window into the evolution of migration, offering rare opportunities to examine the life-history trade-offs associated with migration. For the first time we describe the nature of these trade-offs, using a lek-breeding tropical bird, the White-ruffed Manakin *Corapipo altera*. Previous evidence indicated that weather drives post-breeding migration to lower elevations bringing condition-related benefits. Using elevation-sensitive stable isotope measurements and >1200 hrs of behavioural observations, we show that migratory male manakins incur costs of diminished social status and matings with females the following breeding season. Because migratory tendency depends on inter-annual variation in weather, physical costs of displays, and breeding prospects the following year, migratory decisions are subject to both natural and sexual selection with the outcome of such decisions linked to changing climatic regimes. (6644)

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THE IMPACT OF DNA SEQUENCE ALIGNMENT METHOD ON ESTIMATES OF THE AVIAN TREE OF LIFE

Recent estimates of avian phylogeny based on molecular data differ dramatically from most previous estimates and may provide important insights into many aspects of bird biology. However, several estimates depend on DNA sequences that vary in length and must be aligned for phylogenetic analysis. Such alignments have typically been optimized manually, introducing the possibility of observer bias. New computer algorithms now produce much improved alignments, allowing us to probe the impact of completely automated alignments on the inferred tree. We tested six automated alignment methods on the largest available molecular dataset, and found that five of them produced alignments and trees very similar to each other and to the published tree based on manual alignment. The outlier was ClustalW, which produced a slightly divergent tree that was nevertheless more similar to the published tree than to any previous estimate. We also tested the effect of starting trees on alignment and tree estimation. Whether we started with divergent trees from previous estimates or even with randomly generated trees, we always recovered trees very similar to the published tree. (6565)

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TESTING THE ROLE OF GEOGRAPHY AND ENVIRONMENTAL HETEROGENEITY IN DRIVING DIVERSIFICATION OF THE ANTBIRDS (THAMNOPHILIDAE)

We tested the role of regional environmental and geographic factors on speciation and phenotypic evolution rates of the antbirds (Thamnophilidae). It can be predicted that regions where environmental heterogeneity is higher will exhibit higher diversification and phenotypic evolution rates. We constructed a gene-based species-level phylogeny (6 genes, 216 species, 97% of species), examined museum specimens (N=880), measured quantitative features of loudsongs (N=220), and extracted environmental and geographic data (topography, temperature, and precipitation-related) for each species distribution range. We assessed the relationship between evolutionary rates and environmental variability for different clades within the family. Also, we tested whether changes in speciation and phenotypic evolution rates are associated with the invasion of specific biogeographic regions. We found evidence that environmental heterogeneity indeed has some effect in explaining evolutionary rates, but the strength of such effect remains unclear. Different clades seem to respond differently to environmental heterogeneity. (6643)

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HABITAT STRUCTURE AND DEMOGRAPHY OF FLORIDA SCRUB-JAYS.

The Florida Scrub-Jay *Aphelocoma coerulescens* is a federally threatened species that requires specific habitat that has been extensively destroyed and fragmented by humans. We synthesize results from 30 years of research combining demography, habitat dynamics, and habitat management along central Florida's Atlantic Coast. Fragmentation reduced the natural fire regime that once maintained the ecosystem with catastrophic consequences for Florida Scrub-Jays. More than half the potential habitat is no longer occupied, so that it is important to identify potential habitat as it is to determine occupied habitat. Florida Scrub-Jays cannot persist in much of the habitat that remains because it has a structure that causes mortality to exceed recruitment, suggesting further population decline. Restoring habitat to conditions where recruitment exceeds mortality is difficult because degraded habitat either burns poorly or too extensively. Selective cutting of tall vegetation, in combination with a state-dependent strategy to fire manage-

ment may be needed to recover populations. State-dependent strategies rely on monitoring habitat and populations rather than prescribing a fixed interval for management. We present approaches including adaptive resource management to directly integrate science and management. (6576)

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ARE MIGRANTS MORE STRESSED IN URBAN PARKS?

As urbanization increases, migratory bird stopover habitats are more likely to be found in areas of high human density. In this study, I compare baseline and stress response levels of the glucocorticoid hormone corticosterone in the blood plasma of migrants in an urban stopover site and a nearby rural nature preserve. Though some corticosterone can be beneficial in the short term, elevated levels of this hormone over a long period can lead to decreased function of vital processes such as the immune response and reproduction. I predicted that birds captured in the more densely populated urban site would have higher baseline and lower stress response levels of corticosterone in their blood plasma than conspecifics captured in the less densely populated nature preserve during both spring and fall migration. However, preliminary results from one species, the Gray Catbird (*Dumetella carolinensis*), showed no differences in both baseline and stress response levels between the two sites. Because Gray Catbirds often thrive in urban areas, I am continuing to investigate the stress physiology of other migratory species as well. (6569)

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FACTORS INFLUENCING NEST SUCCESS OF LEAST TERNS AND BLACK SKIMMERS WITHIN CAPE ROMAIN NATIONAL WILDLIFE REFUGE, SC, USA.

Cape Romain National Wildlife Refuge (CRNWR) located along the coast of South Carolina, supports abundant beach-nesting birds. Least Terns (*Sterna antillarum*) and Black Skimmers (*Rynchops niger*) both nest within CRNWR and appear to be experiencing declines in nesting numbers. The purpose of this study is to identify variables which influence daily survival of Least Tern and Black Skimmer nests. Variables considered include: year, colony site, nest age, date, clutch, precipitation, ambient temperature, tidal height, and predation events. 257 Least Tern and 346 Black Skimmer nests were monitored across four colony sites over the two year study. Apparent hatch success was 54% and 52% for Least Terns and Black Skimmers, respectively. For Least Terns, nest survival was influenced by year, colony site and predation events. Factors influencing Black Skimmer nest survival were highly variable, and further analysis is needed. Preliminary results identify over-wash and predation as the two principle factors contributing to nest loss of both species. Infrared time-lapse video cameras documented American Mink and Black Vulture entering colonies and consuming eggs. (6392)

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ARTHROPOD COMMUNITIES ASSOCIATED WITH HABITATS OCCUPIED BY SWAINSON'S WARBLERS, A GROUND-FORAGING INSECTIVOROUS SONGBIRD.

The Swainson's Warbler (*Limnothlypis swainsonii*; SWWA) is an insectivorous species of critical conservation concern in the southeastern U.S. These warblers forage on the forest floor and are dependent on a well-developed layer of leaf litter. This reliance on the litter layer likely reflects selection of habitats with abundant populations of potential arthropod food. In 2004 and 2005, we surveyed 1,453 sites using song playbacks, and collected litter and pitfall samples of arthropods at 45 randomly-selected occupied and unoccupied sites. Total mean arthropod abundance, abundance of arthropods ≥ 5 mm in length, abundance of adults, and taxonomic richness were significantly greater in occupied than unoccupied sites for litter-sample data. Abundance of several taxa known to be SWWA food items, notably beetles, was greater at occupied than unoccupied sites. Overall, richness and abundance of large arthropods were the best predictors of SWWA presence. These results suggest that the arthropod community is a driving factor influencing

the presence of SWWAs. Thus, management efforts that improve the leaf-litter layer and promote ground- and litter-dwelling arthropods will be beneficial for SWWAs and other ground-foraging species. (6568)

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REPEATABLE AMONG-INDIVIDUAL VARIATION IN BIOACCUMULATION OF MERCURY-DOSED ZEBRA FINCHES

Mercury is a ubiquitous ecotoxin with numerous detrimental effects on birds. Although mercury accumulates to different levels in different bird species, little is known about the natural variation of within-species mercury accumulation. Zebra finches (*Taeniopygia guttata*) were maintained in controlled environmental conditions on a standardized diet containing either 0.0, 0.1, 0.4, 0.5, or 1.0 mg/Kg methylmercury. Within treatments, individual zebra finches consistently differed in the amount of mercury accumulated in their blood. Among-individual variation in blood mercury greatly exceeded within-individual variation across all mercury dose treatment groups. Among-individual differences in blood mercury accumulation may reflect an underlying genetic basis for mercury mitigation, potentially allowing evolutionary adaptation to environmental mercury contamination if this variation is heritable (genetically or epigenetically). More research is necessary to investigate the heritability of mercury accumulation in birds and to understand gene expression mechanisms underlying mercury tolerance. (6632)

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AVIAN-HABITAT RELATIONSHIPS IN IGUAZÚ NATIONAL PARK, ARGENTINA

Understanding the manner in which habitat impacts bird communities is an important aspect of understanding the overall ecology of a region. Yet few data exist on the relationships between habitat and avian communities in many of the world's most endangered ecosystems, including the Atlantic Forest of South America. In order to examine the impact of habitat components on bird communities in the Atlantic Forest I surveyed avian communities using a combination of mist nets and recorder-based point counts, and measured a wide variety of habitat variables in Iguazú National Park Argentina. I then developed models of habitat variables to predict avian species richness using stepwise multiple regression. Important habitat characteristics for avian richness included diverse stratification, low levels of woody understory stem density, moderate levels of percent vegetative understory cover, variable diameters of overstory trees, low levels of cover by bamboo, and close proximity to strip corridors. These data provide insight into a poorly understood avian community in a critically endangered ecoregion and may contribute to future conservation efforts. (6399)

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THE SPECIES COMPOSITION OF MIXED-SPECIES FORAGING FLOCKS IN IGUAZÚ NATIONAL PARK, ARGENTINA

Species in the Neotropics frequently form mixed-species foraging flocks. These flocks have been well studied at a number of sites, yet few data exist for the interior Atlantic Forest. I performed a study identifying the species composition of mixed-species foraging flocks in Iguazú National Park, Argentina and each participating species' flocking frequency in three habitat types: forest edge, forest interior overstory, and forest interior understory. I placed these species into one of the following four categories for each habitat type: core species, frequent joiners, occasional joiners, and infrequent joiners. Core species for forest edge flocks included the Green-headed Tanager (*Tangara seledon*), Blue Dacnis (*Dacnis cyanea*), Sayaca Tanager (*Thraupis sayaca*), and Epaulet Oriole (*Icterus cayanensis*). Core species for forest interior overstory included Olivaceous Woodcreeper (*Sittasomus griseicapillus*), Guira Tanager (*Hemithraupis guira*), Buff-fronted Foliage-gleaner (*Phylidor rufus*), and Golden-crowned Warbler (*Basileuterus culicivorus*). Core species for forest interior understory flocks included the Black-goggled Tanager (*Trichothraupis melanops*) and Red-crowned Ant-tanager (*Habia rubica*). These data provide a foundation for future research of mixed-species foraging flocks in the region. (6400)

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THE EFFECTS OF CHRONIC STRESS ON BEHAVIOR AND SLEEP IN HOUSE SPARROWS

Although acute stress on birds may have a slight impact on their daily processes such as biological cues for sleep and activity, chronic stress seems to lead to more profound and visible changes in behavior and sleep disruption. The experiment protocol will involve the careful monitoring of 6 individual House Sparrows in captivity, using both stress factors as well as a control group. The stressors will involve factors such as loud music and cage tapping. The protocol will begin after the birds are kept in captivity for 1 month in order for them to acclimate to the new environment (for administering the protocol too early may include the stress the birds feel due to captivity and not the true stress factors). The control situation will be applied first, with no stressors put upon the birds for 2 weeks. The House Sparrows will then be put under the various stressors for 30 min intervals four times a day, after which their sleep activity for their next sleep cycle will be monitored. The stress protocol will be administered for another 2 weeks. The observations will take place with a night vision camera, and sleep measurements such as latency and amount of sleep will be noted. The temperature and body weight of the birds will be monitored as well and any other changes observed in their behavior. This experiment will allow us to determine what impact chronic stress has on bird behavior and how this may relate to human involvement in their environment. (6619)

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POST-BREEDING USE OF REGENERATING CLEARCUTS BY MATURE FOREST BREEDING BIRDS

Information is limited on the extent that mature forest-breeding birds use regenerating clearcuts post-breeding. We have run multiple studies since 1992 investigating bird use of clearcuts. In 1996, we began netting in the Ozarks as part of an experimental study of timber harvest and six netlines have been operated annually in July. Captures peaked in year three, post-cut and have gradually declined since. Early-succession breeding-bird captures exceeded captures of mature forest-breeding birds during the first three years of the study. Since year seven, early-succession captures declined dramatically while forest birds have declined relatively little through year eleven post-cut. Two more netlines operated weekly in two different sites, late June to early August 2010, caught > 400 mature forest-breeding birds. One line showed a seasonal increase of young birds while the other had constant capture rates of young birds. Our data suggest the high importance of regenerating clearcuts to mature forest-breeding bird species post-breeding. (6425)

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CONSPECIFIC ATTRACTION OF A THREATENED GRASSLAND BIRD

No other avian guild has as many declining populations as do grassland birds. In an attempt to ameliorate the continued decline of grassland bird populations a number of Federal and State agencies have developed programs (agri-environment schemes) to encourage farmers to conserve and restore their grassland habitat (hayfields). An assumption of agri-environment schemes is that once habitat is created, the target species will find it and accurately assess its suitability for breeding. However, numerous studies have shown that, when selecting habitat, birds use social information acquired by observing other individuals of the same species (i.e. conspecifics) as a cue to the location of suitable breeding habitat. I propose to experimentally test whether grasshopper sparrows will settle in suitable, yet unoccupied restored habitats via experimental conspecific song playback stations. Experimental conspecific attraction has the potential to provide a mechanism by which birds can reduce energetic and temporal search costs, while also gaining insight into the factors that affect habitat settlement behavior. (6365)

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DO WADING BIRDS NEST NEAR ALLIGATORS BY CHOICE? TESTING THE "NEST PROTECTOR" HYPOTHESIS.

Wading birds appear to preferentially nest above alligators and alligator habitat. Alligators could benefit nesting birds by deterring mammalian predators. Chicks or food dropped from the bird nests could provide alligators with food. We tested selected predictions of this hypothesis using small willow-dominated colonies of little blue herons (*Egretta caerulea*), tricolored herons (*Egretta tricolor*), and snowy egrets (*Egretta thula*) in the central Everglades as experimental units. Using throughfall traps we estimated that a colony of 50 pairs has the potential to drop 1,664 grams of food over a 50-day nesting cycle. This may be nutritionally important to alligators, particularly during the dry season when movements may be limited and food is harder to find. We manipulated apparent densities of alligators using an experimental array of alligator decoys to determine if wading birds were attracted to alligators via visual cues. Tricolored herons showed a strong preference for the alligator decoy sites ($X^2(1, N=38)=6.95, p=0.008$). Thus far, the evidence suggests that wading birds are attracted to nest near alligators, and that alligators receive nontrivial food benefits from nesting birds. (6465)

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COMPARATIVE EFFECTS OF GLARE ON BILL COLOR OF TEMPERATE AND TROPICAL PASSERINES.

Specular reflection from the polished surface of the bill may reduce visual acuity and interfere with visual tasks. Dark-billed wood warblers forage in sun significantly more than pale-billed warblers. Willow Flycatchers (*Empidonax trillii*) moved their foraging into shade when their maxillae were painted white. We observed 140 temperate and 85 tropical passerine species in the field and quantified their bill colors in museums. Many passerines have adapted to foraging in sunlight by evolving a dark maxilla to reduce the reflected glare. Tropical species were more likely to have dark maxillae and have darker maxillae than temperate passerines. Species with pale maxillae can reduce glare by seeking shade and pale-billed species were significantly more likely than species with dark maxillae to forage in shade. Tropical species foraged in shade significantly more than temperate species. Temperate insectivores had significantly darker maxillae than temperate non-insectivores, but tropical species with different foraging behavior did not have differently colored maxillae. The intensity of tropical sunlight and the more complex foraging interactions of tropical birds may explain the increased selection for dark maxillae in tropical passerines. (6502)

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MOLT RATE VARIES AMONG FLIGHT FEATHER TRACTS IN THE CAROLINA CHICKADEE

Most molt studies focus on the primary wing feathers, based on the logistical simplicity of studying the primaries, and the observation that molt in the other tracts is often completed during primary molt. We compared the timing and rate of new feather production among the primaries, secondaries, and rectrices of free-living, molting Carolina Chickadees (*Poecile carolinensis*). The length and mass of the secondaries and rectrices are only 50-70% of those of the primaries, but, respectively, they require 90% and 50% of the time required to replace the primaries. Therefore, feather length and feather mass do not increase at the same rate among flight feather tracts in the Carolina Chickadee. More studies are needed before we will be able to understand the functional significance of variability in molt dynamics among the flight feather tracts, but data presented here, and on other songbirds published elsewhere, suggest that our understanding of the energetic and aerodynamic trade-offs made by small birds during molt will be improved by routinely expanding molt studies to include all three flight feather tracts. (6613)

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COMMON LOON (GAVIA IMMER) SETTLEMENT BEHAVIOR AND REPRODUCTIVE SUCCESS IN AN ERA OF CLIMATE CHANGE

Climate change has the potential to shift and restrict ranges for a suite of species. The birds of the boreal ecosystem, like the common loon (*Gavia immer*), may be particularly at risk given the climate predictions for this biome. Hematocrit analysis, which can describe energetic condition, may be a sensitive indicator of impending range restriction. Using samples collected in New England in 2010 ($n=60$), we have established baseline hemolymph free glycerol and triglyceride levels for Common Loons. Loons of a range of size-corrected masses were in similar energetic condition, which allows us to define the values for energetic regulation of known breeding individuals. We can then compare these results to subsequent years and to other geographic locations along the periphery of current loon distribution to test for changes in the cost of breeding. Additionally, we can use these values to determine how loons will cope with the increased energy demands and decreased resource availability that may accompany climate change. (6480)

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IDENTIFYING IMPORTANT HABITATS FOR AQUATIC BIRD CONSERVATION AT THE YURURIA LAGOON, IN GUANAJUATO, MEXICO

Conservation of inland floodplain systems of Central Mexico is important because they contribute to the long-term viability of bird populations. Our study took place at the "Yururia" Lagoon, a Ramsar site of 15,000 ha located in southwestern Guanajuato, Mexico. During fall and winter of 2010, we censused the aquatic bird community to compare diversity patterns, and bird population densities among aquatic habitats including open water, water hyacinth, tule, and the edge of the lagoon. The greatest species richness and diversity were estimated for tule, followed by the edge of the lagoon, water hyacinth, and open water. All habitats were highly similar in species composition, but tule had 30 unique species, and water hyacinth only had one. Bird density patterns varied among species; generalists had their highest densities at the water hyacinth, and specialized species had high densities in the edge of the lagoon, and tule. We concluded that controlling water depth, conserving existing thule habitat, and reforesting the edge of the lagoon, preferentially with tule, would likely promote the long-term viability of aquatic bird populations associated to this system. (6477)

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MOLECULAR PHYLOGENETICS, PHYLOGEOGRAPHY AND COMMUNITY STRUCTURE OF SALTATORS

Using comprehensive geographic sampling, we produced the first complete molecular phylogeny for the genus *Saltator*. Our results confirm that *Saltator* is not a member of the Cardinalini as traditionally presumed, but is instead a basal element within Thraupini. We also confirm that as historically recognized, *Saltator* is polyphyletic. *S. rufiventris* is not a *Saltator* but has taxonomic affinities elsewhere within Thraupini; and, the monotypic form *Saltatricula multicolor* is embedded within *Saltator*. Analyses of our ingroup taxa (16 biological species) identified more than 25 independently evolving lineages, mostly due to several broadly distributed species (*S. grossus*, *S. maximus*, *S. coerulescens* and *S. striatipictus*) being composed of many deeply structured phylogroups. Ancestral biogeographic reconstruction and molecular dating found *Saltators'* origin in South America followed by multiple crossings into Central America dating to pre- and post-Isthmus completion in the Pliocene. Finally, our analyses of community composition suggest phylogenetic overdispersion (evenness) as better explanation of the data opening new directions to explore the role of ecological filtering and interspecific competition in shaping phylogenetic structure in *Saltator*. (6648)

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EXTRAORDINARY GENETIC AND VOCAL VARIATION IN THE GRALLARIA RUFULA COMPLEX

Grallaria rufula, the Rufous Antpitta, currently considered to consist of seven subspecies, and the monotypic species *G. blakei*, the Chestnut Antpitta, form a superspecies found in the central and northern Andes from Bolivia to Venezuela. Many subspecies of *rufula* are thought to be vocally distinct, indicating that some may be better considered species, and some appear to contain intrasubspecific vocal variants as well. To better understand species diversity and biogeography in the *G. rufula* complex, we have been studying genetic and vocal variation in this group. Our results indicate that the *G. rufula* complex consists of numerous genetic units, almost all of which differ enough vocally to be considered separate biological species. (6587)

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NEST SUCCESS OF SHRUBLAND BIRDS IN URBAN AND RURAL LANDSCAPES OF ILLINOIS

Populations of many shrubland birds that breed in Illinois have declined over the last century, yet little has been done to elucidate the factors contributing to these declines. In 2010, we initiated a study to determine the quality of shrublands in urban and agricultural landscapes in Illinois by locating and monitoring nests and documenting causes of nest failure using video recording systems. Our findings indicate that the nest success of some shrubland species in the agricultural landscape of east-central Illinois was exceptionally low, whereas nest success of shrubland birds in the urban landscape of northeast Illinois was considerably higher. We identified snakes, mainly black ratsnakes (*Elaphe obsoleta*), as the major nest predator in agricultural areas. We documented no nest predators in shrublands within northeast Illinois. In 2011, we increased the scope of our study by increasing the number of study sites in east-central and northeast Illinois and will also be reporting our results from the current breeding season. (6541)

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VERTNET: DISTRIBUTED DATABASES WITH BACKBONE

Alarm over global climate change and loss of biodiversity has resulted in international demand for quick, reliable access to data on the spatiotemporal occurrence of species and their relations to environment. Responses to this demand have led to the development of ORNIS and other NSF-funded distributed database networks (FishNet2, MaNIS, HerpNet), which provide over 85 million records documenting where birds and other vertebrates occur. Together these networks include 171 collections from 12 countries, with another 52 collections committed to participation, and are accessed at nearly 2.5 million records per week. Collectively, they have demonstrated community data sharing and cooperative data management, and participation has far exceeded expectations. NSF recently funded VertNet to address growing problems of scalability, performance, sustainability, and ability to incorporate new members. VertNet will use cloud-based computing to create a fast, cost-effective, and scalable data platform with novel capabilities and applications for data discovery, data quality improvement, and visualization. Its combination of open access to data, new capabilities, and integration with other biodiversity applications will transform the use of vertebrate data for cross-disciplinary research and conservation. (6403)

<http://vertnet.org>

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PHYLOGEOGRAPHIC VARIATION IN THE GRAY JAY, A WIDESPREAD BOREAL CORVID

We describe range-wide phylogeographic variation in the Gray Jay (*Perisoreus canadensis*), a widespread Nearctic boreal corvid that was formerly split into two species. Phylogenetic analysis of mitochondrial DNA (1041 bp of the ND2 gene; N=205, 50 localities) revealed 4 reciprocally monophyletic lineages that largely coincide with known glacial refugia for boreal birds. The most widespread 'Boreal' clade occurs from eastern North America to Alaska and south to Utah. A second 'Colorado' clade is restricted to the Colorado Rockies based on our sampling. Two clades occur in western North America: a 'Pacific' clade in the Coastal Ranges and western Cascades, and a 'Transcascades' clade east of the Cascades and north to at least central Alberta. The Pacific clade is basally divergent and the most differentiated genetically from other clades (4.6-5.1%). The Boreal, Pacific and Transcascades clades occur in sympatry only in a small area in north-central Washington, suggesting that reproductive isolation rather than introgression occurs between clades. We discuss our results in the context of current subspecies, historical biogeography of boreal birds, and glacial cycles. (6387)

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CHECKERBOARD DISTRIBUTIONS OF BIRDS IN THE BISMARCK ARCHIPELAGO

We examine a presence-absence matrix of 154 land and freshwater bird species on 31 islands in the Bismarck Archipelago to assess how competition influences geographic distributions. We calculated the observed number of checkerboards for all species pairs, for congeneric species pairs, and for pairs of species within guilds. Compared with random expectations, there are more checkerboard pairs within both genera and defined guilds, but a detailed examination shows that competition is rarely a cogent explanation. Many checkerboard pairs are regionally allopatric, probably reflecting historical biogeography and dispersal limitation, and most checkerboards include a supertramp species. By themselves, presence-absence matrices provide limited insight into the role of competition in structuring Bismarck bird communities. A major problem is disentangling historical factors from present-day ecology. A geographic perspective with knowledge of colonization routes suggests that many checkerboards likely result, at least in part, from historical biogeography and supertramps. Although species may be forced into supertramp status by competition, other factors (e.g., habitat preference) may be causal, and biogeographical distributions alone cannot distinguish between causes. (6498)

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ENHANCING PRODUCTIVITY OF AMERICAN OYSTERCATCHERS WITHIN THE CAPE ROMAIN REGION OF SOUTH CAROLINA

The Cape Romain Region (CRR) is located along the coast of South Carolina and supports over half of the breeding pairs (approximately 200 pairs) of American Oystercatchers (*Haematopus palliatus*) in the state. Research has shown that oystercatcher productivity in this area is low due to increased predation and overwash from high tides and boat wakes. The purpose of this study was to determine if reproductive failure due to nest loss could be reduced. We piloted a headstarting experiment to increase nest success during the 2010 and 2011 breeding season. We collected partial clutches randomly from nests found in two study areas within CRR and incubated the eggs in an incubator until they hatched and could be returned to their original nest. Wooden dummy eggs that were painted to resemble oystercatcher eggs were secured in the nest scrape to insure that adults continued to incubate. Results suggest that headstarting, combined with predator removal during the pre-laying period, improves oystercatcher productivity in the two study areas. (6509)

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RED JUNGLEFOWL INTRODUCTIONS IN THE SOUTHEAST UNITED STATES: HISTORY AND MODERN RESEARCH LEGACY

Under the Foreign Game Investigation Program (FGIP), a federal-state cooperative program established in 1948, more than 340,000 exotic game birds were released in at least 25 states between 1960 and 1970. One species released in the southeastern U.S. was the Indian Red Junglefowl (*Gallus gallus murghi*). Junglefowl were collected by FGIP personnel from Uttarakhand Pradesh, India from 1959-1962. Between 1961 and 1971 eight states raised and released approximately 9,500 birds in an effort to establish wild populations. However, despite releases at more than 55 sites, no pure populations persisted beyond the early 1990s. However, a population of feral chickens in south-central Georgia may include hybrid descendants of FGIP birds and a pure, captive line derived from FGIP junglefowl also exists. Given the effort FGIP personnel made to collect only pure stock with no introgression from domestic, "village" chickens, an unanticipated legacy of the FGIP may be the persistence of the purest captive population of Red Junglefowl in the world today. Thus, the FGIP may have inadvertently yielded an invaluable genetic resource and research opportunities for the conservation of this species. (6562)

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DEVELOPMENT OF A NON-LETHAL METHOD FOR MEASURING PERSISTENT ORGANIC POLLUTANTS IN ADIPOSE TISSUE OF MIGRATORY PASSERINES

Current techniques for detecting persistent organic pollutants (POPs) in birds are lacking in accuracy and methodology. These limitations prevent us from assessing accurate toxin patterns and trends in birds, ultimately impeding informed conservation. Adipose is the best tissue to sample for accurate determination of pesticide body burdens, often because POPs have high persistence in fat. However, previous fat tissue studies have usually required sacrificing study subjects or salvaging carcasses. This approach results in limited sample size and biased sampling. We are developing a non-lethal method for sampling songbird adipose tissue that will allow us to identify and quantify pertinent POPs. To demonstrate the feasibility of this approach we will spike chicken fat with a POP surrogate and separate using a silica gel column. The surrogate concentration will be quantitatively determined by gas chromatography/mass spectrometry (GC/MS). This technique will be further verified by spiking chicken fat with six polychlorinated biphenyl congeners and an organochlorine mixture. We plan to apply this method to migratory songbirds captured at banding stations in northeastern Arkansas and southwestern Ohio to monitor POP concentrations. (6527)

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A BIRDS EYE VIEW OF CLIMATE CHANGE

We are developing a year-long multi-scaled approach to assess the effects of climate change on birds through investigating changes in the timing of: spring green-up; bird community shifts; species-specific demographic responses; and experimentation designed to test plausible mechanistic avian species responses to climatic changes. We begin with a course orienting the students to geospatial data and models; follow this with a course on ecological modeling where students develop testable hypothesis and models about how climate change may affect our study system; assist the students in conducting the field research necessary to test their hypothesis; and finally, update their models to reflect the data gathered. We are using an integrated educational-research approach that will bring together undergraduate students, graduate students, and professors in a problems-based shared learning environment. This is a three-year project, but because this approach is adaptable to problem solving in any natural resources environment, we hope to develop this into a permanent course focused on problem solving. (6601)

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REPRODUCTIVE SUCCESS OF EASTERN BLUEBIRDS ON SUBURBAN GOLF COURSES

Understanding the role of green-space in urban/suburban landscapes is becoming critical for bird conservation because of rampant habitat loss. While not natural habitat, golf courses could play a role in conservation if they support breeding populations of native species, yet scientists remain skeptical. In 2003-2009, we measured reproduction of Eastern Bluebirds (*Siala sialis*) in Virginia on golf courses and surrounding reference habitats of the type that would have been present had golf courses not been developed on these sites. We evaluated whether conditions on golf courses affected timing of breeding, investment, or nest productivity compared with nearby reference sites. Bluebirds breeding on golf courses reproduced as well as bluebirds breeding in other disturbed habitats. Habitat type had no effect on date of clutch initiation or clutch size, but egg hatching rates and brood sizes were higher on golf courses compared to reference sites. Mortality of older nestlings was also lower on golf courses. Thus, within a matrix of human-dominated habitats, golf courses may support productive populations of some avian species that can tolerate moderate levels of disturbance, like Eastern Bluebirds. (6468)

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THE ISTHMUS OF TEHUANTEPEC AS A BARRIER AND BRIDGE FOR TWO SPECIES OF TROPICAL ORIOLES (ICTERUS GRADUACAUDA AND ICTERUS CHRYSATER)

The Isthmus of Tehuantepec has played an important role in shaping the avian diversity of Mexico, as well as the rest of the Western Hemisphere. It has been both a barrier and a land connector between North and South America for many groups of birds. Here we studied the evolution of two species of orioles whose highland distribution is separated by the lowlands of Tehuantepec: *Icterus graduacauda* (west of the Isthmus) and *Icterus chrysater* (east of the Isthmus). These birds are sister species that diverged very recently (likely <1MYA) and they may have been into contact at some point. We sequenced multiple loci (mtDNA and five nuclear introns) and performed coalescent analyses (IM) to infer the mode of speciation and determine whether there has been subsequent gene flow. Our results indicate that initial divergence resulted from prior occupancy followed by vicariance (as opposed to dispersal and a founder event). Furthermore, we find strong evidence of gene flow since the initial divergence. Thus the Isthmus of Tehuantepec provided the initial barrier but since has provided a bridge for gene flow. (6516)

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HOW THEY DECIDE: AN ANALYSIS OF MIGRATORY DECISIONS MADE BY SONGBIRDS ON STOPOVER

Throughout the migratory period, songbirds must integrate information about their energetic condition with synoptic weather conditions. During spring migration, we used release tests to determine departure and directional decisions of songbirds at a stopover site in Maine. Using data from 172 individuals encompassing 9 species we applied a model selection technique to determine the explanatory

ability of variables relating both to energetic condition and weather on migratory decisions. For both departure and directional decisions, variables relating to energetic condition (fat stores, daily mass changes, and plasma triglycerides) comprised the top models. In general, birds with greater fat scores and those that gained body mass were more likely depart on a migratory flight. Additionally, individuals that had a high fuel deposition rate (FDR), as indicated by plasma triglyceride levels, chose a direction that could minimize overall migration distance while those with a low FDR chose a direction that may correspond with the pursuit of a different stopover location. Our study further indicates that energetic condition is an important cue for songbirds when making migratory decisions. (6511)

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PROSPECTING BEHAVIOR, POST-FLEDGING SURVIVAL, AND THE INFLUENCE OF FOREST COVER DURING NATAL DISPERSAL IN A RESIDENT BIRD.

Survival and dispersal during the juvenile life stage are critical to population connectivity and persistence, but the post-fledging period is the least studied stage of the avian life cycle. We intensively radio-tracked Red-bellied Woodpeckers (*Melanerpes carolinus*) from fledging to dispersal to identify patterns of prospecting, test for landscape effects on individual movement, and investigate factors with the potential to affect juvenile survival. Juveniles used a centrally-based foray prospecting strategy previously only associated with cooperatively breeding birds. Woodpeckers repeatedly forayed between returns to the natal home range to roost, and foray direction predicted eventual dispersal settlement direction. Prospecting individuals traveled along paths containing higher forest cover than was randomly available in the surrounding area. Juvenile mortality declined with age and no birds died during prospecting or dispersal stages, which suggests that dispersal is not costly in this species. We provide evidence of juvenile birds making repeated exploratory movements to inform decisions about dispersal prior to permanent departure from the natal area. In addition, we demonstrate the value of landscape habitat connectivity to a dispersing resident forest bird. (6407)

Cox, J. A., Tall Timbers Research Station, USA, jim@ttrs.org GROUP STRUCTURE IN THE COOPERATIVELY BREEDING BROWN-HEADED NUTHATCH

The structure of breeding groups has not been assessed for many cooperatively breeding species. I monitored a population of the cooperatively breeding Brown-headed Nuthatch (*Sitta pusilla*) for 8 years and quantified group structure for 309 territories. Cooperative groups averaged 0.22 (± 0.05 ; annual proportion $\pm$ SD) of the territories monitored. The largest group contained 5 adults, but most cooperative groups contained a single helper (0.87 $\pm$ 0.16) or a pair of helpers (0.12 $\pm$ 0.16). Most helpers (0.69 $\pm$ 0.24) were second-year males. Older males and females assisted neighbors following loss of their nests, but some older males also assisted throughout the breeding season. Pedigree information for 56 individuals suggested most helpers were male descendants of a member of the breeding pair (0.54 $\pm$ 0.24); however, other groups consisted of (1) male helpers not the progeny of breeders (0.36 $\pm$ 0.17); (2) brothers breeding cooperatively (0.05 $\pm$ 0.09); and (3) female helpers (0.05 $\pm$ 0.07) that may or may not be progeny of breeders. Cooperative breeding in this species mirrors the kin-based neighborhoods described elsewhere but also contains novel features. (6408)

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LANDSCAPE AND NEST SITE FACTORS INFLUENCE PREDATOR-SPECIFIC RATES OF NEST PREDATION

Nest predation varies as a function of nest site, habitat and landscape factors, but few data exist that explain the mechanisms driving such variation. We documented 136 predators at the nests of Acadian Flycatchers (*Empidonax virens*) and a guild of shrub nesting species in Missouri and Illinois to determine whether changes in predator-specific rates of predation were responsible for overall patterns of nest predation at multiple spatial scales. At the landscape scale, predation by snakes and Brown-headed Cowbirds (*Molothrus ater*) increased as forest cover

decreased. By contrast, predation by rodents declined as forest cover decreased. At the nest-site scale, predation by corvids and raptors tended to decrease as stem density near nests increased, though the effect in both cases was marginal. Despite the predator-specific patterns we detected, none of the covariates tested explained any variation in overall rates of predation. The interactions between breeding birds, nest predators, and the landscapes in which they reside are scale-dependent and context-specific, and may be resistant to broad conceptual management recommendations. (6417)

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VARIATION IN VISUAL SENSITIVITY AMONG BOWERBIRD SPECIES AND THE IMPLICATIONS FOR COLOR SIGNAL DIVERSITY

Bowerbirds have complex color displays that are highly differentiated among species, yet our understanding of the evolution of color communication in this important avian model for sexual selection research is limited by a lack of information about their visual systems. Recent research highlights the importance of co-evolution between visual spectral sensitivity and color signals. In particular, studies of fishes provide support for the sensory drive model of signal evolution that attributes display diversity to adaptive variation in visual sensitivity. In this study, we compared the visual systems of bowerbirds to assess the possible association between sensitivity and colorful displays. Previous work detected no difference in ultraviolet sensitivity among bowerbirds based on comparison of SWS1 opsin sequence. Here, we sequenced the remaining classes of opsins and we quantified relative proportions and intra-retinal distribution of cone photoreceptors and performed transmission spectrometry and microspectrophotometry to characterize the spectral properties of ocular media, visual pigments and colored oil droplets. The results of this study have important implications for understanding the evolution of signal design in birds and other colorful terrestrial taxa. (6358)

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ELEVATIONAL ZONATION AND MULTI-SPECIES DIVERGENCE ACROSS BARRIERS IN NEOTROPICAL MONTANE BIRDS

In the species-rich humid forests of the tropical Andes, deep valleys bisect avifaunas. The amount of phenotypic variation in Andean birds with linear distributions is often more pronounced at higher elevations, which presumably reflects a role for elevational zonation. We aim at investigating how the interplay between barriers and the stratified elevational ranges of the Andean avifauna influenced population differentiation. We sequenced a mitochondrial gene for every specimen collected along elevational transects (1100-3100 m) that expanded along opposing slopes of two major valleys. The avifauna separated by the Tachira Depression (N=110 population-pairs; 1030 specimens) shows variable levels of genetic divergence (0-8%). The upper montane birds (>2200 m) exhibited higher genetic divergence across this valley than lower montane birds (t-test -3.44, p<0.001). We implemented a coalescent-based ABC analysis to identify pulses of divergence in the avifauna separated by valleys. For birds separated by the Marañon valley, we found support for two or three pulses of divergence. Our study is providing insights into the role of an important ecological trait of the Andean avifauna, elevational zonation, in population differentiation and ultimately speciation. (6655) <http://www.museum.lsu.edu/cuervo.html>

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ROADS IN SALT MARSHES: SALT MARSH SPARROW NEST SURVIVAL AND FLOODING IN TIDALLY RESTRICTED MARSHES

Saltmarsh Sparrows (*Ammodramus caudatus*) reside exclusively in Atlantic salt marshes and are a high conservation priority throughout their range. Tidal restrictions, created by roads bisecting salt marshes, alter marsh hydrology and may affect sparrow nesting ecology. On four marshes with 0-2 restrictions, we

investigated relationships between tidal restriction and probability of (1) nest survival, N=66 nests, and (2) tidal flooding, N=269 (nest plus randomly-located non-nest sites). We used logistic exposure and logistic regression models with an information theoretic approach to test restriction effects. There was no difference in nest survival at restricted versus unrestricted marshes or above versus below roads. However, precipitation had a significantly negative effect on survival in restricted marshes but no effect in unrestricted. There was significantly less flooding at nest versus random locations. In addition, odds of flooding on restricted marshes decreased by 44% in areas above restriction while odds of flooding on unrestricted marshes increased by 194% in comparable areas (>1300m upriver). Most Saltmarsh Sparrow nest failure is due to tidal flooding, and our results will ultimately help guide efforts to manage their habitat. (6546)

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CULTURAL DIVERGENCE AS A DRIVER OF GENETIC DIVERGENCE IN A TROPICAL BIRD

Among tropical taxa, many species exhibit divergence in phenotypic traits and neutral genetic markers over short geographic distances; however, few studies examine components of reproductive isolation. Our previous research has shown divergence in female preferences for male song dialects over short geographic distances in a tropical bird. Preference for local dialects may lead to assortative mating, creating a mechanism where cultural divergence drives genetic divergence on a small spatial scale. We are testing this mechanism further by determining if dialectal differences are correlated to genetic differences among 8 populations across the Andes Mountains, spanning the east/west and elevation boundaries of a widespread bird, the Rufous-collared Sparrow (*Zonotrichia capensis*). Specifically, we are investigating if dialects vary among populations and if the genetic variation correlates to dialectal variation among populations. We assessed variability at 13 microsatellite loci and found significant variation in allele frequencies across all samples (N=189). Preliminary analysis suggests that there are significant differences in both dialects and genetics among populations. These results provide novel evidence that cultural divergence and subsequent assortative mating may be a mechanism driving speciation. (6504)

<http://filebox.vt.edu/users/jcastner/Welcome.html>

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EXPERIMENTAL SUPPORT FOR WINTER FOOD LIMITATION OF A TEMPERATE MIGRANT

Migratory birds might encounter factors in multiple seasons and locations that limit their population size. One such factor, winter food abundance, could limit migratory bird populations 1) indirectly, by affecting future reproductive success and 2) directly, by immediately affecting winter population size. In long-distance migrants, which winter in relatively mild climates, winter food has been shown to limit body condition and migration timing, but not survival. Winter food limitation has not been tested on short-distance (temperate) migrants, which winter in relatively energetically challenging environments. We performed the first test of winter food limitation on a temperate migrant, the Swamp Sparrow (*Melospiza georgiana*), with a plot-wide food supplementation experiment. Following food addition, birds significantly increased fat, muscle, and size-corrected mass, indicating that food limits body condition, which is thought to affect future reproductive success. Individuals with supplemented food and those with higher body condition experienced significantly higher within-season survival. Last, on supplemented plots, immigration significantly increased population size. Our results provide novel support for winter food limitation of temperate migrants and emphasize the importance of considering winter habitat for their conservation. (6537)

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 CRYPTIC INTROGRESSION INTO AN APPALACHIAN SKY ISLAND POPULATION OF BLACK-CAPPED CHICKADEES

Black-capped chickadees (*Poecile atricapillus*) hybridize with Carolina chickadees (*P. carolinensis*) along the species' contact zone across the eastern United States and in the northern Appalachian Mountains. The Great Smoky Mountains harbor the last large breeding population of *atricapillus* in the southern Appalachians, isolated from the species main range by nearly 200 km. This population was believed to be reproductively isolated from local *carolinensis* due to a behaviorally-mediated elevational range gap during the breeding season, which may function as an incipient speciation mechanism. I characterized this population genetically, using hundreds of AFLP loci spread throughout the genome as well as cytochrome-b sequence data from the mitochondrial DNA. The Great Smoky Mountain population of *atricapillus* has experienced genetic introgression from *carolinensis*, but at a much lower level than other populations near the northern hybrid zone. This population is also differentiated from northern conspecifics, likely due to historically reduced gene flow. (6579)

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TRANSLOCATION SUCCESS AND THE DESPOTIC BEHAVIOR OF FLORIDA SCRUB-JAYS

From 2003 to 2010, we translocated a total of 51 Florida Scrub-Jays *Aphelocoma coerulescens* from sites permitted for development to a large, recently restored site on which a conservation easement had been established as mitigation. Prior to 2003, 6 jays in 2 groups occurred on the recipient site. From 2003 to 2008, we moved only helpers or single birds from the development site to the recipient site. By the 2008 breeding season, after having moved 25 birds, the population had grown only to 6 groups. In late 2008, we began moving entire family groups, moving them in November rather than February, and reducing hacking times. By spring 2011, the population had grown to 29 groups, 23 of which were comprised of translocated birds or their descendants. We discuss how our methodological changes reduced the despotic influence of resident jays on released birds and improved translocation success. (6620)

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MULTI-LOCUS PHYLOGEOGRAPHY OF AUSTRALIAN TEALS (ANAS spp.): THE INFLUENCE OF DISPERSAL POTENTIAL ON POPULATION STRUCTURE

Abstract. The Australian Grey Teal (*Anas gracilis*) and Chestnut Teal (*A. castanea*) are closely related sister species, but differ in some key behavioral characteristics. The Grey Teal is highly nomadic and geographically widespread in Australia, whereas the Chestnut Teal is more sedentary and confined to southeastern and southwestern Australia. We hypothesized that differences in behavior, and hence dispersal potential, would influence the partitioning of genetic variation across potential barriers to gene flow. We sequenced mitochondrial DNA (mtDNA) and five nuclear introns (nuDNA) for 49 Grey Teal and 30 Chestnut Teal. Overall, Chestnut Teal populations were more strongly structured (mean $\Phi_{st} = 0.114$) than were Grey Teal (mean $\Phi_{st} = 0.031$). Surprisingly, a greater proportion of the total genetic variation was partitioned among populations within species ($\Phi_{sc} = 0.035$) than between the two species ($\Phi_{ct} = 0.003$), and the coalescent based "Isolation with Migration" (IM) model suggested a deeper divergence between eastern and western Chestnut Teal populations than between the species. We conclude that life history characteristics contributed to the partitioning of genetic variation within these species, but the divergence between species remains enigmatic. (6427)

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DELAYED DISPERSAL IN WESTERN BLUEBIRDS: RESOURCES AND PARENTS

Western bluebirds (*Sialia mexicana*) exhibit delayed dispersal of sons, family-group territoriality in winter, and low levels of adult helpers at the nest. Winter groups rely heavily on oak mistletoe as a food resource, and members defend winter territories against other groups. Past experiments showed that reducing mistletoe by half causes sons to disperse in fall rather than stay home for winter. Here we demonstrate that both resources and parents are important in determining the natal philopatry of sons during the both fall and spring steps of dispersal. Sons more often stayed home for winter when they had parents alive or when their parents had high quality territories and thus abundant berry resources to share. However, while mistletoe likely accounts for high winter survival of western bluebirds in mistletoe-oak woodland, variance in survival was low and nearly all young males survived their first winter (based on 6 years of data). This suggests that sensitivity of fall dispersal to mistletoe volume levels the playing field for winter survival of philopatric males remaining in areas with abundant mistletoe, and that sensitivity to mistletoe volume during the spring dispersal step is more closely tied to local breeding opportunities and the benefits of continued interaction with kin than to access to winter food. (6529)

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THE INFLUENCE OF AROMATIC CONTENTS ON MOUNTAIN PLOVER NEST SURVIVAL

The Mountain Plover (*Charadrius montanus*) is a ground nesting bird that is patchily distributed in western North America. Their nests are located in open areas, are depredated by mammals, birds, and snakes, and distraction displays are utilized to distract predators when eggs are close to hatching. I analyzed the contents of 450 nests during a 5-year study (2004-2008) in Montana to relate nest survival with the presence of aromatic nest contents that might mask the nest from detection by predators that use scent cues. Nest survival was positively correlated with the presence of asters (*Asteraceae* sp.), dense clubmoss (*Selaginella densa*), and black-tailed prairie dog (*Cynomys ludovicianus*) dung in the nest contents. The presence of lichens, rocks, and other materials was not correlated with nest survival. This suggests that the Mountain Plover lines its nest with items that may increase nest survival by hiding the eggs from predators. Studies such as this add an important level of understanding to patterns of nest survival in birds. (6589)

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FUNCTION OF SOLO SONGS AND SONG JOINING IN THE RED-BACKED FAIRY-WREN

We investigated how solo singing and song joining in the Red-backed Fairy-Wren (*Malurus melanocephalus*) vary across breeding stages and within different behavioral contexts. Song rates for males and females are higher in the pre-breeding stage and in the female's receptive stage than in the nesting stage. Auxiliary helper song rates were generally low and did not vary across breeding stages. Song rates are similar between aggressive and non-aggressive contexts. Males joined the highest proportion of female songs (in duet) in the pre-breeding stage, while females joined male songs equally often in the pre-breeding and receptive stages. Males, females and helpers joined the highest proportion of each other's songs in aggressive vs. non-aggressive contexts. Taken together, these results suggest that male solo singing and song joining between all members function for territory defense in the Red-backed Fairy-wren. (6621)

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DIVERSIFICATION BY LOCAL ADAPTATION ACROSS AN ELEVATIONAL GRADIENT IN ANDEAN TIT-TYRANTS (AVES: TYRANNIDAE)

Diversification of Andean birds is driven by geographic isolation along the latitudinal axis of the mountain ridge. Subsequent range expansion often leads to para-

patric elevational replacement of related taxa. Mechanisms for the maintenance of stable, vertically displaced distributions are poorly known, but might include local adaptation to abiotic conditions. We investigated the role of local adaptation in maintaining species limits between the smaller, widespread *Anairetes reguloides* (Pied-crested Tit-tyrant) and the larger, high-elevation *Anairetes nigrocristatus* (Black-crested Tit-tyrant). We analyzed mitochondrial DNA data, morphometric characters, and blood-oxygen carrying capacity across an elevational transect that spans the distributions of both species on the west slope of the Peruvian Andes. Mitochondrial DNA indicates that *A. reguloides* diversified northwards below the elevational distribution of *A. nigrocristatus*. We found intermediate phenotypes along a narrow contact zone, suggesting at least limited hybridization. Blood data suggests that *A. nigrocristatus* is less susceptible to high-altitude hypoxic respiratory stress than *A. reguloides* where both species occur at similar elevations. Thus, differential adaptation to high altitude appears to promote stable parapatry along an elevational contour. (6393)

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THE INFLUENCE OF COOPERATIVE EXPERIENCE ON ANNUAL AND LIFETIME REPRODUCTIVE SUCCESS OF ALPHA MALE LANCE-TAILED MANAKINS

Lance-tailed manakins display cooperatively, but not all males serve as beta helpers before attaining alpha breeding status. I investigated how variation in beta experience influenced the fundamental relationship between time as an alpha and annual and lifetime reproductive success using eleven years of data on social status and siring success in a wild population. I found that alpha males increased in reproductive success throughout their breeding tenure, and all experienced a low in ARS in their first year as alpha. Former betas became alphas at older ages, but did not have longer or more productive alpha tenures. LRS increased linearly with tenure for alphas that were never beta, and ontogenetic change during alpha status was the primary determinant of reproductive success in these males. In contrast, success of former betas was influenced by ontogeny in the first year of alpha status and by selective disappearance at advanced ages which left highly successful survivors in later tenure classes. Individual heterogeneity in reproductive behavior therefore generates an overall non-linear relationship between alpha tenure and lifetime reproductive success at the population level. (6532)

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AGE MATTERS: ADULT AND JUVENILE SURVIVAL RATES WILL RESPOND DIFFERENTLY TO CLIMATE CHANGE

Established methods exist for identifying the impacts of environmental stressors on demographic processes, yet these methods have rarely been used to project the impacts of climate change. This study examined the effects of weather and density on adult and juvenile survival rates in a population of Song Sparrows (*Melospiza melodia*) in central coastal California. Thirty years of mark-recapture data (N=4,608) were analyzed to test hypothesized effects of weather on survival, and to calculate expected average adult and juvenile survival rates under several climate change scenarios. Adult survival rates were most strongly and negatively affected by summer precipitation, and secondarily by winter weather. Juvenile survival was also most sensitive to breeding season conditions, but indirectly, through the effects of the previous winter's weather on primary and secondary productivity. Under each of the climate change scenarios, the average adult survival rate is projected to increase, while the average juvenile survival rate is projected to decrease, due to warmer winter temperatures. This approach provides insight into the age group, time of year, and mechanisms that will drive the population's response to climate change. (6472)

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CHANGES IN METABOLIC INTENSITY OF TISSUES IN STAGING EARED GREBES

Eared Grebes (*Podiceps nigricollis*) show no difference in basal metabolic rates (BMR) despite major differences in body composition. It has been argued for other birds that BMR shifts with changes in the mass of metabolically active

organs. Absent that in grebes, we hypothesized a change in the metabolic intensity of those organs (first proposed by T. Piersma). We report here on results for (mass-specific) lactate dehydrogenase (LDH) and citrate synthase (CS) in muscles (pectoralis, gastrocnemius, cardiac) and visceral tissues (gizzard, liver, kidney). We looked at grebes in two phases of staging that differ in body composition but not BMR: "fat" grebes that were hyperphagic, too heavy to fly, with hypertrophied viscera but atrophied flight muscles; and "late" grebes that were smaller and preparing for migration, with reduced viscera but enlarged flight muscles. Only gizzard showed a difference in LDH (late stagers were lower). But we found that CS activity in late stagers increased for pectoralis and decreased for kidney and gizzard. These results provide early confirmation of our hypothesis, but we are continuing this investigation. (6646)

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AREA SENSITIVITY IN BREEDING AND WINTERING GRASSLAND BIRDS ON FORT HOOD, TEXAS

Grassland birds are considered to be area sensitive when habitat use varies with patch size. We investigated area sensitivity in breeding and wintering grassland bird populations on Fort Hood, TX between 2008 and 2010. Logistic regression was used to examine the effect of patch size on detections of selected grassland species. Bell's vireos, Cassin's sparrows, dickcissels, Eastern meadowlarks, grasshopper sparrows, northern bobwhites, lark sparrows, and scissor-tailed flycatchers all showed a positive relationship between area and occurrence during the breeding season. Of the selected wintering grassland birds, only chestnut-collared longspurs, meadowlark spp., and savannah sparrows showed a positive relationship between area and occurrence. Wintering field sparrows had a significant negative relationship between area and occurrence. Wintering vesper sparrows, grasshopper sparrows, and LeConte's sparrows were not area sensitive. A difference in area sensitivity between seasons was observed in grasshopper sparrows. This seasonal difference in habitat use demonstrates the need for caution in using information based on breeding ecology to make conservation decisions for wintering grassland birds. (6617)

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THE EFFECTS OF PRESCRIBED BURNS ON VEGETATION AND SWAINSON'S WARBLER SPATIAL USE PATTERNS IN THE ST. FRANCIS NATIONAL FOREST, ARKANSAS.

The Swainson's Warbler (SWWA) is a species of conservation concern in the southeastern U.S. that breeds primarily in bottomland hardwood forests. In spring 2007, prescribed burns were implemented in St. Francis National Forest, where we have studied SWWA ecology since 2004. In 2008 and 2009, we investigated the effects of prescribed burns on vegetation and the spatial use of SWWAs. We found home-range sizes with extensive burning (mean=14.42±2.24 ha; N=13) were significantly larger than home-range sizes with partial burning (mean=6.06±3.61 ha; N=5) and unburned home ranges (mean=8.51±1.55 ha; N=27). Vegetation data were collected to compare points used by the birds to randomly-selected points. Points used by SWWAs had greater litter cover, depth, and volume, greater densities of cane (*Arundinaria gigantea*), shrub, vine, and total stems, and greater understory vegetation density than random points. Our data suggested that SWWAs tolerated the effects of prescribed burns and that this management may improve the habitat quality by increasing cane and shrub stems over the long term. (6557)

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USE OF EARLY SUCCESSIONAL VEGETATION BY FOREST-BREEDING BIRDS: CONVENIENCE OR NECESSITY?

The previous presentations have suggested the importance of the post-breeding period to the annual demography of mature forest breeding birds. We have documented the use of alternative habitat types after the young are fledged and/or independent. In most cases, these alternative habitat types include early successional habitats such as clearcuts. This post-breeding period can be as long as three

months in areas such as the Missouri Ozarks, while in Canada it may involve just a few weeks. Here, we synthesize patterns of post-fledging habitat use by forest-breeding birds in an attempt to understand the importance of this behavior in the demography of forest migrants and how such habitat shifts affect management decisions. We begin with a survey of how forest-breeding birds vary in use of alternative habitat types after breeding, then examine evidence related to the fitness consequences of shifting habitat types, with suggested needs for future research. We end with a look at how a requirement for an alternative post-fledging habitat type modifies the general model used to understand the annual demography of long-distance migratory birds. (6447)

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EXPERIMENTAL TRANSLOCATION OF FLORIDA SCRUB-JAYS: REVIEW AND PROGNOSIS OF AN ESSENTIAL CONSERVATION TOOL

Three translocations of Florida Scrub-Jays have occurred, each differing in methods, scope, and outcome. In all three, translocated birds remained and bred on the release site. The first translocation moved 14 nonbreeders and three breeding pairs to an isolated site with limited carrying capacity, and the population was eventually extirpated. Another recent effort augmented two small populations by moving entire family groups from areas permitted for development. Seven families were moved, and both populations have grown. In the largest effort, 51 birds, both individuals and entire family groups, were translocated to a large, restored, unoccupied site between 2003 and 2010. Population growth was slow between 2003 and 2008 but has since increased rapidly. Currently, the population numbers 29 groups on-site or on adjacent public land, with 23 comprised of translocated birds or their descendants. As scrub-jay populations become smaller and more isolated, natural dispersal may be insufficient for growing populations in restored habitats. Translocations are time-consuming, costly, and limited by availability of source populations and recipient sites. Nonetheless, translocation can be an effective method for reintroducing or augmenting scrub-jay populations. (6442)

<http://www.archbold-station.org/station/html/research/avian/avian.html>

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ANALYSIS OF POPULATION TRENDS AMONG FOUR WINTERING BIRD SPECIES IN EASTERN MASSACHUSETTS USING CBC DATA.

Christmas Bird Count data from 1979-80 through 2009-2010, a period associated with increasing ambient temperatures, were analyzed for eight count circles in eastern Massachusetts. Species of interest included Red-bellied Woodpecker (RBWO), Northern Mockingbird (NOMO), both southern affinity species, as well as American Robin (AMRO), and Ruby-crowned Kinglet (RCKI), both of which may be expected to increase if climate is warming. Analyses were conducted to determine if increased ambient temperature is correlated with population trends for these bird species and to determine possible interactions between species. Each species exhibited statistically significant trends. RBWO increased significantly but NOMO, after an initial increase, is now declining. AMRO has shown dramatic increases especially in the past decade. RCKI numbers vary among sites but appear to be increasing slightly. The observed trends likely are affected by different environmental factors, though increasing populations in three of the four species could be related to climate change. (6367)

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MOBILE REMOTE SENSING OF FOREST STRUCTURE AND HABITAT QUALITY

Forest structure in urban-wildland interface areas is related to a range of processes such as forest age, health, disturbance, and management and has implications for habitat quality. Forest structure is often assessed using remote sensing technolo-

gies such as LiDAR (light detection and ranging) to measure forest canopy height, volume and distribution. However, using airborne sensor platforms to make measurements under dense forest canopies of elements such as dead standing trees, understory vegetation, and woody debris, which are also important factors for habitat quality, remains a challenge. To measure these elements, supplementary ground level measurements are indispensable. Mobile remote sensing provides opportunities for citizen scientists to measure these elements at a ground level, covering broad geographic areas. We present a methodology to measure forest stand structure, including understory components such as dead standing trees, understory vegetation, and woody debris using mobile personal communication devices. Our application assesses forest fuels loading and the need for fuels treatment in urban-wildland interface areas. We anticipate that private property owners, park managers, and concerned citizens will be motivated to use the application to protect communities and property from wildfire risk, and this data will be available to assess important ecological conditions including overall habitat quality and its suitability for avian biodiversity. (6402)

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GREAT EGRETS SELECT AGRICULTURAL IMPOUNDMENTS OVER FRESHWATER MARSHES AS FORAGING HABITAT IN SOUTHWEST LOUISIANA.

It has been suggested that agricultural impoundments (e.g. rice fields and crawfish ponds) serve as suitable replacements for natural wetlands as foraging habitat for some wading bird species. Much effort has been taken to describe the use of rice fields by birds, but few studies have made comparisons to use of natural wetlands. Similarly, crawfish aquaculture may provide habitat for wading birds, but has been less researched. Southern Louisiana is regarded as an important region for wading bird populations and provides an opportunity to compare use of natural freshwater marsh to rice and crawfish impoundments. We conducted aerial surveys during the breeding season of great egrets (*Ardea alba*) to assess foraging habitat selection within a 30 km radius of active colonies. Our results indicated that agricultural impoundments were used 2.6 times more than expected given their availability ($p < 0.0001$) and were selected over natural wetlands which were used less than expected ($p < 0.001$). We observed a large proportion (43%) of egrets in crawfish ponds. This suggests that crawfish ponds are selected for by a considerable portion of this breeding population. (6608)

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REMARKABLY RESTRICTED DISPERSAL ACROSS NARROW HABITAT GAPS IN THE FLORIDA SCRUB-JAY, AND ITS CONSERVATION IMPLICATIONS

Florida Scrub-Jays exhibit poor dispersal abilities and a high degree of habitat specialization, suggesting that genetic differentiation among adjacent populations might increase with the width of habitat gaps separating them. We confirmed this relationship empirically, using 20 microsatellite loci sampled across 18 paired populations separated from one another by gaps of 600 m to 32 km. The relationship is not an artifact simple isolation-by-distance, as genetic distance was not correlated with the Euclidean distance between geographic centroids of the adjacent populations. Our results demonstrate that habitat gap size affects movement behavior even at remarkably local spatial scales, producing direct consequences on the genetic structure of fragmented populations. Conserving genetic continuity within the few remaining, large regional populations will require maintenance or restoration of preserve networks in which habitat gaps do not exceed the species-specific threshold distance. This challenge is compounded by the close dependence of Florida Scrub-Jays on early post-fire successional habitat, as fire suppression has effectively increased habitat gap sizes even where oak scrub itself has not been eliminated. (6622)

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CLOSING PORTIONS OF A BEACH DECREASES DISTURBANCES TO OVER-WINTERING RED KNOTS

While most Red Knots overwinter in South America, a portion overwinter in Florida. A decline in the number of Florida wintering Red Knots is suspected and one potential cause for the decline is human-related disturbances of birds while they are foraging or roosting. We restricted public access year-round to a portion of a busy county beach in Pinellas County, Florida. For the next two years, we monitored Red Knot flocks once/week in this closed area, the remaining portion of the county beach, and two additional municipal beaches where large numbers of Red Knots have been recorded. During monitoring we recorded the number of times the birds moved in response to a disturbance and the source of the disturbance. Red Knots in the closed area were able to forage or roost longer before being disturbed, foraged and roosted longer in the area before leaving, and had fewer disturbances/hour. These differences could not be explained by differences in food availability, tide, or weather. Future research should focus on the role of disturbance on weight gain. (6420)

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ANTICIPATING RISKS TO SHOREBIRDS FROM CLIMATE CHANGE

Shorebirds are an important component of the ecosystems in which they live, they are valued by the general public, and might act as sentinels of global change. Consequently, we are concerned about the current widespread declines of many species of North American shorebirds, and the anticipated effects climate change might have. The USFWS lists 3 North American shorebirds as Threatened or Endangered; IUCN lists 5 as Near Threatened or at higher risk, and 4 additional species in these categories for the Western Hemisphere. We created a categorical risk model to anticipate the expected effects of climate change on shorebirds and apply it to shorebirds breeding in North America. The model is designed to integrate with U.S. Shorebird Conservation Plan risk categories and PIF. It is based on anticipated changes in breeding, migration, and wintering habitat, degree of dependence on ecological synchronicity, migration distance, and degree of breeding, migration, or wintering ecological specialization. Of the 49 taxa we evaluated, 43 (85%) are predicted to significantly increase their risk of extinction; no species decreased their risk category. (6460)

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BIRD RESPONSES TO ANTHROPOGENIC DEGRADATION OF SEMI-ARID HABITATS IN CENTRAL MEXICO

We evaluated the effects of changes in vegetation structure and composition resulting from anthropogenic degradation (vegetation removal, and overgrazing) on birds in semi-arid, shrubland-dominated habitats of central Mexico. We hypothesized that ecological stress generated from degradation would affect organismal immune system, decrease presence and density of native species, and species diversity would decrease, due to increases in dominance of generalist species. At the individual level we found high heterophil/lymphocytes ratios, and hemoparasites irrespective of habitat degradation suggesting that there may be additional ecological stressors. At the population level, densities and presence of generalist and opportunistic species tended to be higher in relation to specialists in degraded sites, but this trend did not hold in all cases. Species richness and dominance was highest in the most degraded sites, whereas the highest diversity corresponded to pristine sites. Our overall conclusion was that habitat degradation negatively affected native avifauna, but this effect was not evident at all three levels of organization. (6466)

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HIGH-USE NESTING SITES PREDICT SEASONAL REPRODUCTIVE SUCCESS INDEPENDENT OF FEMALE IDENTITY IN AN INSULAR SONG SPARROW POPULATION

Differences in habitat quality are advocated as an important factor contributing to seasonal reproductive success of individual birds. However, few studies have been able to decompose variation in habitat-specific success with sufficient power to link habitat with reproductive output, controlling for annual effects of climate, population density, or individual female quality. We investigated heterogeneity in both use and reproductive output of nesting habitats in an insular population of Song Sparrows (*Melospiza melodia*) over 35 years of continuous monitoring. Sparrows nested in certain sites more frequently than expected, and were more likely to nest in high-use sites in years of low population density. For annual first nesting attempts, we found significant heterogeneity between sites for the proportion of both eggs hatched and young fledged, while controlling statistically for both year effects and individual female identity. Overall, our results suggest that nesting micro-habitats preferred by females over the last 35 years were those that maximized hatching and fledging success early in the season and increased the total number of broods produced annually, perhaps as a consequence of favorable micro-climate and food availability. (6499)

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USE OF MONOTYPIC CHINESE TALLOW TREE STANDS BY RESIDENT AND MIGRANT BIRDS IN SOUTHEAST TEXAS

Many factors affect avian habitat use, including vegetative heterogeneity. Monotypic stands typically support fewer bird species than mixed stands because the habitat is more homogenous; however, some bird species occur at higher densities in monotypic stands due to the presence of species-specific resources. The Chinese tallow tree (*Triadica sebifera*) is an invasive species in the southeastern United States that grows in monotypic stands. This study compared forest bird use of mature and young tallow stands with use of native mixed-species forest stands throughout the year. Avian species richness was significantly higher in native forest stands than in young tallow stands year-round, but only significantly higher than in mature stands in spring. Density of birds was higher in native forest stands than in young tallow stands in all seasons, but only significantly so in summer and spring; density did not differ significantly between native forest stands and mature tallow stands in any season. Overall, native forest stands were used by more forest bird species than tallow stands, but mature tallow stands provided suitable habitat for some species of forest birds. (6464)

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CHARACTERISTICS OF PRAIRIE DOG COLONIES OCCUPIED BY MOUNTAIN PLOVERS AND BURROWING OWLS IN NORTHEASTERN NEW MEXICO

The Mountain Plover (*Charadrius montanus*) and Burrowing Owl (*Athene cunicularia*) are species of conservation concern that appear to benefit from prairie dog activities that modify habitat. During spring 2009 and 2010, I studied habitat use by these species on 45 black-tailed prairie dog (*Cynomys ludovicianus*) colonies in northeastern New Mexico. My objective was to determine if Mountain Plovers and Burrowing Owls were selecting colonies with particular habitat or landscape characteristics by comparing occupied and unoccupied colonies. To document distribution, observers completely searched each colony at least 3 times annually, mapping evidence for both species. Each year I also conducted extensive habitat sampling and used GIS data to obtain colony size and landscape features. For 2009 and 2010, respectively, I found breeding evidence of Burrowing Owls on 82% and 93% of colonies, and of Mountain Plovers on 32% and 30% of colonies. Owls were widespread and showed little preference for colonies with specific characteristics. Colonies occupied by Plovers contained, on average, less forb coverage, shorter vegetation, and were larger with a greater proportion of colony coverage within a 2 km radius. (6382)

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EFFECTS OF NEST MICROBIAL COMMUNITY ON OFFSPRING QUALITY IN GREAT TITS

Although bird-microbial interactions are increasingly studied, the influence of nest microbial community on offspring quality is still uncertain. To address this, great tit (*Parus major*) nestlings were removed from their natal nestbox at day 15 post-hatching and biometrics were taken to quantify offspring quality. Immediately after fledging (approx day 18 post-hatching) nestboxes were swabbed and bacteria (28 species) and fungi (11 species) were cultured under sterile laboratory conditions. Total microbial load did not correlate with offspring quality. Opportunistic pathogens (including *Aspergillus flavous*, *Microsporum gallinae*, *Enterobacter cloacae* and *Candida albicans*) were present in few nests (*Epicoccum purpurascens* was significantly inversely related to offspring quality, with abundance explaining 31.9% of offspring quality variation. Given that quality at fledging is an important influence on longevity and fecundity, it is suggested that the importance of natal nest microbes in shaping life histories is further investigated. (6368)

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TIMING IS EVERYTHING: CONSEQUENCES OF CLIMATE-INDUCED CHANGES IN PHENOLOGY

To improve the optimality of reproduction, birds need to synchronise breeding with maximal availability of food resources. Advancement of springs (higher temperatures at earlier dates), is altering prey phenology, and birds must respond to avoid phenological mismatches. In the UK, resident woodland insectivores (*Cyanistes caeruleus*, *Parus major* and *Sitta europaea*) advanced their lay date by up to 8.8 days between 1974 and 2004. For all species, selection for early laying was consistent over time, suggesting that phenological adjustment was appropriate and sufficient. Migratory birds (*Ficedula hypoleuca* and *Phoenicurus phoenicurus*) did not adjust and selection for early laying increased, suggesting that delay was maladaptive. Further analysis for *F. hypoleuca* showed that this was not due to direct migratory constraints (birds were at the breeding site almost one month before breeding) but might be related to limited phenotypic plasticity. Findings indicate that some species are tracking climate change successfully while ecologically-similar species, at the same site, are failing to do so. (6378)

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RELATIONSHIP BETWEEN DISTANCE TO TURBINE AND REPRODUCTIVE SUCCESS OF SHRUB-NESTING PASSERINE BIRDS IN NORTH-CENTRAL TEXAS

We investigated the potential fitness consequences of wind facility development on Black-capped Vireos and other shrub-nesting songbirds in Texas by analyzing the spatial relationship between nest success and distance to the nearest wind turbine. Fieldwork during both seasons consisted of nest searching and monitoring efforts using basic Mayfield methodology; in 2009 at NextEra Energy's Wolf Ridge Wind Energy Center in Cooke and Montague Counties, Texas, (327 nests of 16 bird species), and in 2010 at NextEra Energy's Horse Hollow Wind Energy Center in Taylor and Nolan Counties, Texas, (153 nests of Black-capped Vireo). We employed conventional and original analyses of Mayfield's Daily Survival Rate (DSR) and related statistics, as well as information theoretic analysis of multivariate Mayfield logistic regression models to characterize relationships between nest success and distance to the nearest wind turbine. We found no evidence of a relationship between wind turbine proximity and reproductive success in any of the cases we analyzed, suggesting that wind facility development is not likely to have significant impacts on the fitness of these species. (6383)

<http://www.pandionsystems.com/Resources/PandionProjects/FeaturedProject/tabid/145/smId/799/ArticleID/13/reftab/113/t/Shrub-Nesting-Passerine-Collaborative/Default.aspx>

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THE BREEDING BIRD COMMUNITY OF COASTAL GOLF COURSES IN BEAUFORT COUNTY, SOUTH CAROLINA

South Carolina has the highest number of golf holes per capita in the U.S., with the largest concentration of courses located in the coastal zone. The prevalence of the golf course landscape there provides both the opportunity and necessity of studying the effects of this land use on the native avian community. We conducted point count surveys over 23 golf courses in Beaufort County May 25-Aug 1 2010, with the objective of measuring the bird community at multiple spatial scales. Avian community metrics such as species richness, abundance, diversity, evenness, and PIF score were calculated and subsequently correlated with landscape variables. Species richness was positively correlated with area of the golf course, reflecting the typical species-area curve. Neotropical migrant richness responded positively with total edge, potentially because the neotropical migrants detected require a range of habitats, and edge represents the interface between differing habitats. PIF score, however, responded negatively to increasing landscape shape index, which is a measure of edge weighted for area of a course. This may reflect the response of higher concern native species to habitat fragmentation. (6553)

<http://people.clemson.edu/~pjodice/people.html>

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MODELING FECUNDITY IN BIRDS: CONCEPTUAL OVERVIEW AND SIGNIFICANCE IN AVIAN BIOLOGY.

Fecundity (which we define to be the number of young raised per female per year) is fundamental to many questions of fitness, population dynamics, evolution, conservation and management in birds. For all the efforts to measure fecundity or its indices over the past century of avian research, it is still frequently mis-measured, misrepresented and misunderstood. Fundamentally, the problems arise because of partial observability of underlying processes such as re-nesting, multiple brooding and temporary emigration. Among the key misconceptions is the relation between nest success (a commonly used surrogate) and actual fecundity. More recently, various analytical approaches have been developed to estimate fecundity from incomplete biased data. In this presentation, we identify current methods for modeling fecundity, place these models under a common conceptual framework depicting explicitly the component processes of reproductive success, and provide insights for future considerations and challenges in the application of fecundity models. (6572)

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RESPONSE TO ALARM AND NON-ALARM CALLS BY TUFTED TITMICE AND CAROLINA CHICKADEES IN NORTHWEST TENNESSEE

Alarm calls are often given by members of mixed-species flocks to warn conspecifics of a potential threat, coordinate the flock, or signal a predator that it has been spotted and is no longer a threat. Tufted Titmice (*Baeolophus bicolor*) and Carolina Chickadees (*Poecile carolinensis*) are often observed in mixed flocks. We hypothesized that chickadees and titmice will not respond to heterospecific breeding calls but will respond to heterospecific alarm calls. During a three minute observation period we noted breeding and alarm calls given by both titmice and chickadees. We played four breeding calls of one of the focal species, followed by an additional three minute observation period. We waited five minutes then repeated this protocol with alarm calls. Contrary to our hypothesis, both chickadees and titmice responded to heterospecific breeding calls. This response may be used to locate other flock members or food sources. We did not observe a significant increase in response to conspecific and heterospecific alarm calls, but did observe other behavioral responses. This suggests that increasing sample size and behavioral categories may lead to different results. (6398)

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HISTORIC AVIAN MIGRATION AND DIET DATA SETS AT PATUXENT WILDLIFE RESEARCH CENTER

Patuxent Wildlife Research Center is home to several historic databases of value to ornithologists, including the North American Bird Phenology Program (NABPP) and the Stomach Contents Records. We describe the origin and historic use of the datasets, recent use, and potential uses and value. Both data sets originate in the late 1800s and continue into the mid 1900s. The NABPP started as migration notes reported by observers, and the continued collection and organization of these data, as well as a growing data set on food habits of birds in relation to agricultural production, became the impetus for the AOU to successfully lobby for the formation of the Economic Ornithology program within the USDA Division of Entomology. Government biologists published extensively from these sources through the early 1900s, but the material became largely neglected after mid-century. The current urgency of documenting phenology and global climate change, combined with technological advancement, has created important opportunities for new uses of these databases. We discuss recent and ongoing projects, and opportunities for ornithologists to use, help preserve, and increase access to these important resources. (6545)

<http://www.pwrc.usgs.gov/bpp/>

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VOCALIZATIONS AND MATE CHOICE IN THE GREATER PRAIRIE-CHICKEN

In lek-mating systems, females receive only a genetic contribution to offspring from mates rather than resources, parental care, or any other direct benefit. The Greater Prairie-Chicken (*Tympanuchus cupido*) is a lek-mating bird whose males perform a highly stereotyped mating display that includes a substantial vocal component. We hypothesized that aspects of male vocalizations are correlated with other indicators of fitness such as display rate and physical size. In addition, we hypothesized that vocalizations are more closely linked to male mating success than are morphological traits such as body size. We recorded vocalizations of displaying males from five leks and analyzed them in the context of behavioral observations and mating success. We found vocalizations to vary among individual males, and the rate of vocalizations to decline later in the morning. This observational study addresses the variability of auditory display components in a lek-mating bird and sheds light on factors females use to discriminate between potential mates in this species. (6543)

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FORM AND POTENTIAL FUNCTIONS OF THE CHIRR SONG ELEMENT, A PHYSICALLY CONSTRAINED SIGNAL, IN THE SONGS OF NORTHERN CARDINALS

At the ends of long songs, both male and female Northern Cardinals sometimes sing a prolonged "chirr" syllable whose duration is physically constrained: cardinals cannot take a breath during a chirr. Chirrs are sung during escalating territorial interactions between males, and in courtship and feeding interactions between males and females. Chirr duration might provide information to rivals and to potential or actual mates about the singer's lung capacity and general cardiovascular health. We will describe patterns of chirr durations in series of sequential songs sung by cardinals during both intra- and intersexual interactions. (6524)

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PATTERNS OF RELATEDNESS IN THE COOPERATIVELY BREEDING BROWN-HEADED NUTHATCH

Kin selection has often been attributed to the evolution of cooperative behavior. In birds, this is often accompanied by restricted dispersal of offspring, resulting

in close clustering of related individuals leading to fine-scale spatial genetic structure. Brown-headed nuthatches (*Sitta pusilla*) breed in groups of 2-5 individuals. At Tall Timbers Research Station, we found that many helpers are male offspring from previous years, although we have also observed female helpers. In addition, adult males from neighboring nests, or from more distant territories, were also found to assist following failure of their nest. These latter cases suggest that relatedness may not always be high in groups, suggesting the possibility of shared parentage as a benefit. We examined group structure and parentage using nine polymorphic microsatellite loci in order to determine relatedness of individuals within and between family groups. Initial genetic analyses find that helpers unrelated to the breeding pair occur regularly, suggesting kin selection may be only one of several forces responsible for maintaining cooperative breeding in these birds. (6493)

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FOOD HABITS OF BREEDING BALD EAGLES (*Haliaeetus leucocephalus*) IN FLORIDA BAY, EVERGLADES NATIONAL PARK

In the 1980's, Florida Bay underwent dramatic ecological changes due to altered freshwater inflows that caused a cascade of effects, including changes in prey-fish assemblages. We documented food habits of the struggling Bald Eagle (*Haliaeetus leucocephalus*) population to look into the hypothesis that food is the limiting factor to their success. We used digital video to monitor nest provisioning, collected prey remains, and compared these to historical data from the 1970's. About 4,500 hours of video was recorded at 4 nests over 2 breeding seasons (2009-2010). Initial results show that over 95% of deliveries are fish and are made about 2.5 times/day. 1108 individual prey remains from 44 species were collected in the 1970s, and 217 remains from 13 species were collected in 2009-2010. We found remains consisted of 75% fish and 22% birds in the 1970s and 81% fish and 18% birds in 2009-10. Hardhead Catfish (*Arius felis*) made up the majority of prey remains in both time periods, but increased 67% to 87% of fish and 51% to 71% of all remains from the 1970s to 2009-2010. (6551)

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DRIVERS OF PASSERINE PRODUCTIVITY IN RIPARIAN WILLOW SCRUB: AN IMPORTANT ELEMENT OF MATRIX HABITAT?

We report the results of a twenty year study of passerine productivity in the scrub habitat on the flood plain of the river Great Ouse in eastern England. Standardised data from mist-netting, collected as part of the British Trust for Ornithology's Constant Effort Site (CES) banding scheme, permitted evaluation of the effect on productivity of environmental variables using Generalized Linear Models. The productivity of some species (e.g. willow warbler *Pyloscopus trochilus*) was sensitive to winter floods, whereas the productivity of others (e.g. long-tailed tit *Aegithalos caudatus*) was shaped by total rainfall in the spring, timing of heavy rainfall and cold snaps. Tracking the breeding performance of blue tits (*Cyanistes caeruleus*) and great tits (*Parus major*) using nest boxes, we found that these species had lower clutch sizes and lower chick weights than in preferred woodland habitat. However, their breeding performance in willow (*Salix*) scrub was relatively good when breeding was late in the season, when resources were diminished and chick production was poor in woodland habitats. Using LiDAR we identify how habitat structure within riparian scrub relates to breeding success. (6440)

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FEEDING CHOICES IN HOUSE SPARROWS AND BIOCHEMICAL ANALYSIS OF FRUIT SAMPLES

We investigated several invasive plant species in the nearby University of Michigan - Dearborn Natural Area to determine how birds are using them. In particular, we examined the feeding preferences of House Sparrows (*Passer domesticus*) for these species. Our research detailed the fruits of four invasive species at UMD: Common Buckthorn (*Rhamnus cathartica*), European Privet (*Ligustrum vulgare*), Amur Honeysuckle (*Lonicera mackii*) and Oriental Bittersweet (*Celastrus orbiculatus*). We documented the location, fruit dimension, mass and seed count for each species. The House Sparrows were subjected to a series of feeding tests to

determine if they would eat these berries, and, if so, whether or not they preferred any particular species. We found that the House Sparrows ate the berries do eat all four of the berries, but that they have a preference for European Privet. We are currently continuing research to determine the reason(s) behind this preference. We are performing biochemical analysis of the fruit samples we collected to determine protein, lipid, nitrogen, carbohydrate and total energy content. We hope that these data will help to establish why the birds are selecting these fruits. (6657)

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DENSITY AND NEST SUCCESS OF THE DICKCISSEL AT A NORTH TEXAS WIND FARM

Wind energy development, which experienced tremendous growth in the U.S. over the past decade, overlaps considerably with the breeding ranges of many grassland birds and represents a potential threat to these populations. In 2010, we studied Dickcissel density along a 500-m gradient from wind turbines at a wind farm in north-central Texas. We found higher Dickcissel density 301-400 m from wind turbines compared to within 100 m from the turbines; however, mean visual obstruction (VOR) by vegetation was also greater 300-400 m from wind turbines, resulting in a significant positive correlation between Dickcissel density and VOR. We also monitored nest success at 65 nests. No nest was found within 100 m of a turbine. Nesting success did not differ between nests near turbines (100-400 m) and nests far from turbines (401-900 m). In both distance categories, mean VOR at nests was significantly greater than mean VOR at non-nest locations. Our data indicate that Dickcissels choose similar nest site characteristics regardless of distance to turbine, and that Dickcissel nest success is not affected by the presence of wind turbines. (6564)

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OXIDATIVE STRESS AND TRADE-OFFS IN THE COOPERATIVELY BREEDING FLORIDA SCRUB-JAY (*APHELOCOMA COERULESCENS*)

Oxidative damage results from the inability of an organism to cope with reactive oxygen species, formed as byproducts of metabolism. The resulting damage to various classes of biomolecules has been implicated in both debilitating diseases and cellular senescence. Using the cooperatively breeding Florida Scrub-Jay (*Aphelocoma coerulescens*), we tested several predictions regarding oxidative damage and life history. Specifically, we predicted that oxidative damage would: 1) increase with age; 2) alter reproductive output; and 3) increase with reproductive effort. We found that oxidative damage levels were significantly lower in nestling birds, relative to adults. Males, but not females, with relatively higher levels of pre-breeding oxidative damage, demonstrated significantly less reproductive effort as measured by the pairs' number of eggs, nestlings and successful fledglings. Post-reproduction oxidative damage levels were higher than pre-reproductive levels in males, but not females. Finally, females that spent more time on their nests during nestling development produced nestlings with lower oxidative damage levels. We are currently experimentally manipulating dietary antioxidants in male breeders to more directly assess the correlation between oxidative damage and reproductive effort. (6421)

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RESPONSE OF A FOREST AVIAN COMMUNITY TO URBANIZATION MEASURED AT MULTIPLE SPATIAL SCALES

Urbanization is rapidly changing the southeastern US landscape, particularly in Georgia within and around the Atlanta metropolitan area. Landscape composition and configuration vary across the urban-rural gradient as a consequence of human and natural disturbances. Previous studies have suggested that avian communities respond in scale-dependent ways to urbanization-related landscape changes through changes in abundance and diversity. We conducted a 2-year study (2007-2008) of the response of breeding bird population abundance, community abundance, species richness, and relative diversity in recent and established single-family residential areas to 15 landscape characteristics measured

at multiple spatial scales across urban-rural development intensity gradients near Athens, Georgia. Our models suggest strong relationships between the landscape and both community and population abundance of birds and a weaker relationship with species richness. We provide a framework for a landscape scale understanding of the effects of housing developments and development intensity on breeding birds and show how available geospatial metrics of human disturbance and landscape pattern can be used to model breeding bird abundance and diversity in across urban-rural gradients. (6602)

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THE EFFECTS OF POTENTIAL CONSERVATION RESERVE PROGRAM LOSS ON HENSLOW'S SPARROWS IN THE UNITED STATES

The Henslow's sparrow (*Ammodramus henslowii*) is a species of high conservation concern due primarily to long-term population declines. Habitat loss is considered to be the most likely cause of historic Henslow's sparrow declines, and the recent establishment of large acreages of undisturbed grasslands through the Conservation Reserve Program (CRP) has been shown to provide recent population benefits. Due to the program's demonstrated benefits, concern has been raised regarding the future of the CRP program and the large number of acres set to expire in the next few years. I use data on CRP enrollment, pasture, rangeland, and hay acreage, and bird abundance from the Breeding Bird Survey to develop a model that I then used to evaluate the potential impact of projected CRP losses on Henslow's Sparrows within their U.S. range. The model suggests that Henslow's Sparrow populations may drop by roughly one-third by 2017 if all CRP acres are allowed to expire and no new enrollments replace lost acres. The model also suggests that other non-CRP grasslands may help buffer projected population losses. (6538)

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SISTERS OR BROTHERS? INTRABROOD SOCIAL ENVIRONMENT INFLUENCES SEXUAL SIZE DIMORPHISM AND FEMALE HELPING BEHAVIOR IN RED-COCKADED WOODPECKERS

The social milieu experienced by developing nestlings has the potential to influence their growth and life history strategy, particularly if competition over shared resources differs between the sexes. Here, we used 16 years of Red-cockaded Woodpecker demographic data to examine whether sexual dimorphism in nestlings is a fixed trait in this species or dependent on intrabrood social environment. We also explored the effect of natal brood sex-ratios on several life history traits. Nestling growth curves did not differ between the sexes and female nestlings were equivalent to males in size when raised without brothers. However, females were smaller than males when raised in mixed sex broods, suggesting that sexual dimorphism may stem from the superior competitive ability of males rather than inherent sex differences. The sex-ratio of the natal brood did not influence the probability of first year survival or the probability of becoming a breeder for either sex. Within females, however, nestlings raised as singletons were the most likely to become natal helpers as yearlings, suggesting that social factors may also contribute to the rarity of female helping behavior. (6492)

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CONDITION IS MORE THAN NUTRITION: A NEW CONCEPTUALIZATION OF A KEY ORNITHOLOGICAL CONCEPT

Condition is a nearly ubiquitous term in the behavioral, physiological, and evolutionary literature on birds, yet existing definitions are incomplete or ambiguous. Too often in the ornithological literature, condition is defined as nutrient reserves. This poor conceptualization has led to confusion regarding what is being signaled by condition-dependent traits and how to interpret links between ornamentation and individual characteristics such as nutrient reserves, oxidative state, and immunocompetence. I propose that the combined effects of the somatic state, epigenetic state, and genotype of an organism determine condition. I define condition as the relative capacity to maintain optimal functionality of vital systems within the body. A condition-dependent trait is a conspicuous feature of an organism that enhances perception of condition. If the honesty of ornamental traits

derives from connections to vital cellular processes then there is no need to invoke a fitness cost of ornamentation to insure signal honesty. (6473)

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PARENTS OR PREDATORS: EXAMINING INTRASEASONAL VARIATION IN NEST SURVIVAL FOR A MIGRATORY PASSERINE

The risk of nest predation can vary within a breeding season for birds, but few data exist that explain why such variation occurs. We investigated intraseasonal variation of nest survival for Acadian Flycatchers (*Empidonax virens*) in Midwestern forests and tested whether four adult reproductive strategies (clutch size, nest concealment, nest visitation rates, nest height) explained survival trends across the breeding season. We also identified nest predators with video cameras to determine whether variation in predator-specific predation rates explained overall seasonal variation in predation rates. Period nest survival for flycatchers exhibited a quadratic relationship with Julian date, but generally increased throughout the breeding season. Nest height increased as the breeding season progressed but did not explain any variation in nest survival. No other reproductive trait exhibited significant intraseasonal variation. Overall, predator-specific predation rates did not vary seasonally, but there was a marginal decline in the risk of failure from avian predators as the season progressed. Changes in predator abundance or activity are likely the primary contributor to intraseasonal variation in nest survival for Acadian Flycatchers. (6431)

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POPULATION-LEVEL, LONG-TERM IMPACTS OF EMERGING DISEASE IDENTIFIED USING CITIZEN SCIENCE DATA

Pathogens and parasites can limit or regulate the sizes of host populations, and citizen science data are useful for describing the long-term impacts of newly emerged diseases. We are studying the impacts of two recently emerged pathogens of North American birds: West Nile virus and the bacterium *Mycoplasma gallisepticum*. West Nile disease has caused major declines in populations of many species of birds. Here, we present new results that describe recoveries of bird populations from outbreaks of West Nile disease, focused on answering two questions: (1) are recoveries of bird populations occurring only after West Nile disease has declined in prevalence (i.e. is there evidence of population-level acquired or evolved immunity)? and (2) are patterns of recovery similar across severely-affected species of birds? In our second study system, severe inflammations of tissues around the eyes of House Finches (mycoplasmal conjunctivitis) have allowed direct monitoring of disease, as well as host abundance, by citizen scientists. We describe how these citizen science data have motivated controlled experiments designed to identify the causes of apparent long-term limitation of House Finch populations by *M. gallisepticum*. (6471)

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IN SEARCH OF INDICATORS OF BREEDING READINESS AS CARRY-OVER EFFECTS FROM THE PRE-BREEDING TO BREEDING PERIODS IN THE ATLANTIC PUFFIN, *FRATERCULA ARCTICA*

To broaden our understanding of how events during the non-breeding period can influence breeding success, we are examining variation in breeding readiness during the early laying period in the Atlantic Puffin at Machias Seal Island. We have shown that cohorts of birds captured by box-trapping and, therefore, of unknown breeding status compared to those extracted from active burrows, are more likely to include individuals unable to meet their energy demand: in 2009 and 2010, box-trapped birds had elevated plasma free glycerol levels, indicating that they were unable to maintain fat reserves. In contrast, glycerol levels in confirmed breeders grubbed from active burrows were low. Ninety-eight percent (48/49) of grubbed birds had brood patches (BP) while only 46% (17/37) of box-trapped birds did.

Birds without BPs had significantly higher glycerol levels than those with BPs. BP development may take several weeks and its onset may occur well before birds arrive to breed. Thus, BP status during the breeding onset period may serve as an indicator of events that occur away from the breeding area and 'carried over' into breeding. (6374)

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INTEGRATING ACOUSTIC SURVEY METHODS INTO A BROAD SCALE MIGRATION MONITORING EFFORT IN THE GULF OF MAINE REGION

Pressure in the Gulf of Maine region from major coastal development projects has pushed for greater understanding of the timing and intensity of migration, the location of key flyways and stopover sites, and the species of birds using them. In 2009, banding efforts revealed a major flyway along the mid-coast Maine region. In 2010, the new Northeast Regional Migration Monitoring Network began a region-wide effort combining banding, visual surveys, radiotelemetry, and surveillance radar with passive acoustic monitoring of nocturnal flight calls. Acoustic records are revealing variation in the spatial distribution of major bird groups during fall migration. For example, on 4 out of 5 nights during 8-13 Oct., Metinic Island (~ 11 km offshore) had a higher proportion of 'warbler-type' calls compared to Petit Manan Point (coastal mainland 113 km to the northeast) where higher proportions of 'sparrow-' and 'other-' type calls were recorded (Chi-square, $P < 0.001$ for each night). Passive acoustic surveys, which documented several regional species of concern not readily detected by visual surveys and banding, provide important information that complements the other techniques deployed by the Network. (6384)

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EFFECTS OF DIFFERENT MANAGEMENT STRATEGIES ON LESSER PRAIRIE-CHICKEN GROWTH RATE: RESULTS FROM A POPULATION VIABILITY ANALYSIS

Lesser prairie-chicken (*Tympanuchus pallidicinctus*) populations have declined range-wide since the early 1900's by an estimated 97%. We captured and radio-marked females on leks in the northeast Texas panhandle during spring and fall 2008-2010. We used radio marked individuals to estimate vital rates throughout the year. We conducted series of population viability analyses to estimate the effect of changes in vital rates on population growth. We conducted 1,000 iterations for each simulation to variation in vital rates. The model component with the greatest mean elasticity was fecundity (0.54; SE = 0.08) followed by juvenile survival (0.30; SE = 0.03) and adult survival (0.16; SE = 0.07). We simulated increases in vital rates to determine the potential impact on population growth rate of management strategies aimed at improving survival and reproduction. When vital rates related to fecundity were increased by 10 and 15 percent, the proportion of growth rates that were positive were 40 and 60 percent, respectively. Given our results, management for lesser prairie-chickens in the northeast Texas panhandle should focus on increasing survival between hatch and the next breeding season. (6505)

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THEORETICAL PERSPECTIVES ON NON-ANALOG COMMUNITIES

Predicting impacts of global change on communities is a substantial challenge. A 'no analog' community is one found at one time, for which there is no comparable community at another time. Many analyses of the potential for non-analog assemblages emphasize direct impacts of climate on species, e.g. using climate envelop

approaches. But several factors can confound such projections. The properties of species are not fixed but can evolve by microevolutionary processes. The concept of the fundamental niche of a species relevant to climate change is the evolutionarily realizable niche, not just the current niche. Understanding the factors that determine the evolutionary conservatism or lability of niches is an important dimension of non-analog communities. Moreover, all species live in complex communities where they experience webs of negative and positive interactions. Theoretical models help illuminate how these evolutionary and community processes can alter projections of climate impacts. The talk will summarize a recent TREE piece provides pointers for thinking through this community dimension of climate change, and combine this with theoretical studies on niche conservatism to reflect on the no-analog community phenomenon. (6651)

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ELECTROLYTE AND WATER BALANCE IN THE RUBY-THROATED HUMMINGBIRD

The liquid diets of hummingbirds can present a physiological challenge because their kidneys display obligatory losses of electrolytes. Thus consumption of human-provided sugar-water that is free of electrolytes may leave birds in negative water balance. The goal of this study was to determine the minimal concentration of sodium and potassium required by Ruby-throated hummingbirds. Individual birds (N=21) were isolated, fed one of 4 diets with added potassium, sodium, and chloride, and were monitored for water and electrolyte balance. Birds maintained body mass on the electrolyte diets but lost mass when consuming sugar-water. Bird consuming < 5 mmol/L of potassium and < 1mmol/L of sodium displayed a net loss of these elements suggesting that these animal were in electrolyte deficit. Birds consuming 32 mmol/L of potassium and 11 mmol/L of sodium excreted excess electrolytes suggesting that requirements had been exceeded. These results indicate that sugar-water likely contributes to electrolyte and water imbalance in hummingbirds and that this problem can be resolved with relatively small supplements of sodium and potassium to artificial nectars. (6547)

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WOOD-WARBLER VOCALIZATIONS IN RESPONSE TO FLIGHT CALLS

During migration birds give simple vocalizations known as flight calls that are used primarily during sustained periods of flight. During fall 2010, we investigated flight calling in response to both conspecific and heterospecific calls at Braddock Bay Bird Observatory (Greece, NY) and Powdermill Nature Preserve (Rector, PA). Focal species included Magnolia Warbler (*Dendroica magnolia*), Blackpoll Warbler (*D. striata*), and Yellow-rumped Warbler (*D. coronata*). Each bird was presented with one of four cues, flight calls of one of the three species or a control (spring peeper, *Pseudacris crucifer*). Birds were more likely to give calls in response to other birds and were more likely to give calls in response to conspecifics. We documented large variation in rate of flight calling, ranging from 0.3 to 54.7 flight calls per minute. Examining the Magnolia Warbler we observed mean rates of 5.7 ± 8.4 (n=15) to the Blackpoll Warbler, 10.7 ± 12.8 (n=25) to the Magnolia Warbler, 1.8 ± 2.0 (n=4) to the Yellow-rumped Warbler, and 0.3 (n=1) to the spring peeper. Understanding these variations has broader implications in the use of flight calls as a means of estimating density of passing migrants. (6584)

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THE HOATZIN GENOME PROJECT

We report the progress of the hoatzin genome sequencing project. The hoatzin is a compelling candidate for genome sequencing because of its functional forelimb claws, foregut fermentation, and uncertain relationships. Its instability in phylogenetic reconstructions between major neoavian clades suggests that it retains a mosaic of incongruent gene phylogenies due to ancient lineage sorting. Data coverage is currently >1.6 gigabases or about the hoatzin's genome size, of which ~17% has been assembled de novo. About 5% of sequences are repetitive. Hundreds of novel polymorphic microsatellite loci will facilitate studies of cooperative breeding and population structure in this widespread species. More than 30% of

hoatzin sequences map to homologous positions in chicken, covering ~8% of each chicken chromosome - already more than the ~5% genome conservation observed across mammals. Most hoatzin sequences map to annotated genes, and sequence divergence in these conserved regions is ~9%. Additionally, 7.5% of hoatzin reads indicate structural differences from chicken. The hoatzin has the largest avian mitochondrial genome yet characterized. It includes a large "tThr-CR" duplication and heteroplasmic 60-70 base repeats that vary in number 33-fold. (6647)

<http://biology-web.nmsu.edu/houde/hoatzin.htm>

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EXPLORATORY BEHAVIOR VARIES WITH MIXED-SPECIES FLOCKING PARTICIPATION AND FORAGING GUILD

Exploratory behavior, the gathering of information about aspects of the environment for the satisfaction of future needs, is fundamental in animal decision-making regarding foraging, habitat selection, and dispersal. This behavior is highly heritable and serves as a reliable intra-specific indicator of animal personality variation. We examined variation in exploratory behavior among 6 selected forest bird species offering natural contrasts in foraging guild and propensity to join mixed-species flocks. In 10-min aviary trials with video recording, we assessed 8 different measurements of exploration, including flights, hops, scanning components and separated spatial thoroughness. Our multiple exploratory measures approach refines interspecific comparison of exploratory behavior among species. Above-ground insectivores exhibited longer active scanning times; ground omnivores explored a higher proportion of the ground; flocking species flew more; and non-flocking species stayed on the ground. Both foraging guild and flocking propensity explained significant interspecific variation in exploratory behavior. (6377)

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THE MHC CLASS II B GENES OF BALD EAGLES ARE SUITED TO ASSESSING LOCAL POPULATION DIFFERENTIATION.

In widespread species, local populations diverge when they adapt to the specific conditions that each experiences. These locally adaptive characteristics can be important for species survival in the face of environmental change. We characterize the MHC class II B gene number, structure, polymorphism, and expression to determine its usefulness in assessing adaptive population differentiation. Bald eagles contain two copies of the MHC class II B gene, and at least one pseudogene. One gene is expressed at higher frequency than the other. Ten alleles were identified in 19 individual birds collected in Alaska and Florida; the most common alleles found at a location were only found at that location. Variation is concentrated within and adjacent to exon 2. Within exon 2, variation is concentrated in peptide binding codons; these show a signal of balancing selection. The genetic distances among eagle alleles is comparable to that between published sequences from 14 other birds of prey. These results indicate that selection maintains variation, and favors different alleles in different locales, making the gene suitable for examining adaptive genetic differentiation among subpopulations. (6422)

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THE MHC CLASS II B GENES OF BALD EAGLES ARE SUITED TO ASSESSING LOCAL POPULATION DIFFERENTIATION.

In widespread species, local populations diverge when they adapt to the specific conditions that each experiences. These locally adaptive characteristics can be important for species survival in the face of environmental change. We characterize the MHC class II B gene number, structure, polymorphism, and expression to determine its usefulness in assessing adaptive population differentiation. Bald eagles contain two copies of the MHC class II B gene, and at least one pseudogene. One gene is expressed at higher frequency than the other. Ten alleles were identified in 19 individual birds collected in Alaska and Florida; the most common alleles found at a location were only found at that location. Variation is concentrated

within and adjacent to exon 2. Within exon 2, variation is concentrated in peptide binding codons; these show a signal of balancing selection. The genetic distances among eagle alleles is comparable to that between published sequences from 14 other birds of prey. These results indicate that selection maintains variation, and favors different alleles in different locales, making the gene suitable for examining adaptive genetic differentiation among subpopulations. (6423)

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MOVEMENTS OF BLACK VULTURES CAPTURED AT KENNEDY SPACE CENTER

As black vulture *Coragyps atratus* populations increase, so do their impacts on human activities, including interactions with civilian and military aircraft. Florida has one of the largest black vulture populations in the US. To understand more fully the potential management issues related to the Florida black vulture population, we initiated a program to study movements of black vultures at the Kennedy Space Center (KSC). Since April 2009, we have captured, tagged, and released 121 birds fitted with uniquely coded patagial tags. Additionally, we equipped 5 birds with solar powered GPS satellite transmitters to document in more detail their long-term movement patterns. To date, a total of 50 resightings have been reported from 37 different tagged birds. Most reports are from near KSC (median distance = 28 km). However, birds tagged at KSC have been observed as far as 505 km, 330 km, and 185 km north, south, and west of KSC, respectively. Moreover, the 5 birds with satellite transmitters corroborate in detail that vultures frequenting the KSC range widely and are likely drawn from a vast area. (6455)

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SPATIOTEMPORAL VARIATION IN AVIAN MIGRATION PHENOLOGY: CITIZEN SCIENCE REVEALS EFFECTS OF CLIMATE CHANGE

We utilized data from eBird, an online checklist program where amateur birders can submit their observations for science, to examine spatiotemporal variation in spring arrival date for 18 species over the past 10 years. All species exhibited a latitudinal gradient in arrival date, but species differed in the speed with which they advanced northward. Red-eyed vireo (*Vireo olivaceus*) and common yellowthroat (*Geothlypis trichas*) are among the species that advance most slowly, while house wren (*Troglodytes aedon*) and barn swallow (*Hirundo rustica*) cover the same distance in 50-67% of the time. Over the past decade, there has been a tendency for all species to arrive earlier. However, mean arrival dates vary even more strongly with spring temperature across all species, locations, and years. Species that advanced northward more slowly during migration tended to have stronger phenological responses to temperature. These responses were not uniform across a species range, but were greatest in the southeastern US. This study represents the most spatially comprehensive study of shifts in avian migration phenology, and demonstrates the ecologically and geographically heterogeneous responses to climate change. (6379)

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THE ADAPTIVE SIGNIFICANCE OF PLUMAGE PATTERN OF DOWNY DABBLING DUCKS.

The downy chicks of most species of dabbling ducks are light below and brown above with light slashes on the sides and light spots on the rump. This pattern has been suggested to have a disruptive function, breaking up the outline of the duckling, or a camouflaging function, causing the duckling to blend in with the dark bottom of a pond that is dappled with sunlight. We agree with those assessments, but have also evaluated situations in which the pattern suggests mimicry of a swimming mammal and in which startling "eyespot" are presented, either of which we suggest might be an effective deterrent to an aerial predator. (6518)

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AN AGENCY-ORNITHOLOGY DIALOG: BIOLOGY, REALITY, AND COMMITMENT IN THE LISTING AND RECOVERY PROCESS

The Endangered Species Act directs that actions such as listing, state and federal cooperation, permitting, enforcement, and recovery planning be based on best available science. In the case of the Florida Scrub-Jay, we are blessed with an unusually deep and well-documented scientific understanding of the species, its ecological needs, and threats it faces. We also are blessed with active, capable, and knowledgeable agency personnel at both State and Federal levels. Yet, this high-profile indicator species continues to decline dramatically throughout its range, and faces an uncertain future. We conclude this symposium with an open dialog between the agency ecologist overseeing Florida Scrub-Jay recovery planning and a biologist with 40 years of experience studying the species, both of whom are members of the Florida Scrub-Jay Recovery Team. Our dialog will highlight critical issues in which biologically-based recommendations confront real-world obstacles and dilemmas as the U. S. Fish and Wildlife Service strives to recover and eventually delist the species. The intent is to expose for discussion difficult intersections of biology, policy, and reality in carrying out the mandates of the Endangered Species Act. (6626)

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CONSIDERATION OF THE NON-STATIONARY EFFECTS OF THE RED-COCKADED WOODPECKER AS AN UMBRELLA SPECIES.

Umbrella species can be a useful tool for the conservation of non-target species that share similar habitats and population trajectories. The influence that management actions have on non-target species is seldom evaluated with direct consideration for the non-stationary influence across time and space. Examination of the spatially heterogeneous effects of management strategies can reveal patterns which can be used to identify locations where the umbrella is not working effectively. We investigated the non-stationary relationship between endangered species management for Red-cockaded Woodpeckers (*Picoides borealis*) and non-target avian species listed as species of management concern at Fort Benning, Georgia. Results suggest that management for Red-cockaded Woodpeckers on Fort Benning increases overall diversity of non-target species that occur within the same habitat, but the effect varies greatly across the landscape. If the Red-cockaded Woodpecker is to be used as an umbrella species for other declining songbirds, non-stationary effects should be considered when implementing management plans for the recovery of this endangered species. (6571)

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AVIAN SEED DISPERSAL IN DEGRADED LANDSCAPES: HOW CAN FRAGMENTATION BE BENEFICIAL?

Spatial patterns of seeds dispersed by birds in heterogeneous landscapes are difficult to quantify empirically but are potentially important for the regeneration of habitats such as tropical forest fragmented for human agriculture. To investigate the effects of landscape configuration on avian seed dispersal in fragmented habitats, we created a theoretical model of a spatial matrix of 50% suitable habitat and 50% unsuitable habitat in twelve configurations representing increasing degrees of isolation and fragmentation of suitable habitat. We simulated a disperser moving through suitable habitat in a random walk and dropping seeds at fixed intervals. As a treatment, we varied the distance traveled by the disperser in each time step and measured the number of seeds deposited in unsuitable habitat for each configuration at the end of each model simulation. Our results indicated that as fragmentation increased, smaller distances between fragments of suitable habitat allowed even short-distance dispersers to drop seeds into unsuitable habitat, which can potentially lead to habitat regeneration. Where habitat fragmentation cannot be prevented, we have identified specific patterns of fragmentation that may optimize biological conservation. (6530)

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EVOLUTION OF TRACHEA SIZE IN SANDHILL CRANES

Tracheal elongation (TE) is hypothesized to increase the apparent body size of a calling bird by decreasing acoustic formant spacing which varies inversely with the length of the sound-emitting tube. Sandhill Cranes exhibit TE and rely on vocalizations for territory defense and pair-formation. We analyzed vocalizations from two Sandhill Crane subspecies and found striking differences in formant spacing corresponding to body size differences. We measured 62 Sandhill Crane tracheae and found that males have disproportionately longer and wider tracheae compared to females. After accounting for sex, body mass predicts trachea length, while subspecies predicts trachea diameter. These results suggest that trachea dimensions play critical roles in subspecies recognition and mate selection as females likely choose mates based on an auditory perception of large body size. Observed patterns of TE imply that sexual selection for larger size is balanced by a strong constraint on maximum body size. Phylogenetic comparative analysis of the Gruidae family showed that body mass is inversely correlated with migratory distance, suggesting that flight energetics constrains maximum body size. (6575)

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A NO-ANALOG FUTURE: THE IMPACTS OF CLIMATE AND LAND-USE CHANGE ON BIRD COMMUNITIES IN CALIFORNIA

By facilitating independent shifts in species' distributions, environmental change may result in the rapid development of novel species assemblages that challenge the capacity of species to co-exist and adapt. We examined the potential for changes to California bird communities based on current and future species-distribution models (SDM) in several ways. We quantified the change in communities due to climate to identify possible no-analog communities in the future. Results show the potential for novel communities to occur in up to half of the state by 2070. We also found that human land-use change may have an impact on future species distributions that is as great as or greater than that of climate. Differing sensitivities between species to land-use change may also help facilitate novel communities. Accounting for both these sources of change together will improve our understanding of how species will be impacted and how novel communities may form. In turn, this may provide insight into more effective ways to manage species and habitats in the face of rapid change. (6588)

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ARE WINTERING BELL'S VIREOS SITE FAITHFUL? FILLING A GAP IN BASIC LIFE HISTORY KNOWLEDGE.

Basic knowledge of non-breeding life history traits is lacking in many species of migratory songbirds of conservation concern, such as Bell's Vireos (*Vireo bellii*). Currently, information on non-breeding biology of this species is limited to range and habitat associations. Our objectives were to assess if individuals are inter- and intra-annually site faithful to non-breeding sites and to describe individual movements at the site level. We color-banded ($n = 44$) and re-sighted Bell's Vireos during three winters (2009-11) in Jalisco, Mexico, on and near the Chamela-Cuixmala Biosphere Reserve. Maximum distance an individual moved between years ranged from 6.6 to 338 m ($n = 7$), while that within years was 12 to 309 m ($n = 20$). Our preliminary results provide evidence that Bell's Vireos are site faithful within and between years, but reveal variability among individuals in movement distances that may be related to sex, age, habitat type or habitat condition. We are using this new information to design further research examining factors driving this variation in site fidelity. (6508)

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IDENTIFYING PATHWAYS TO COOPERATION: FLIGHT CALLS AND KIN RECOGNITION IN SUPERB STARLINGS

Kin selection, or reproductive strategies that favor an organisms' relatives, is often invoked to explain the evolution of cooperative breeding behavior in birds. Understanding how individuals recognize relatives in these complex societies where some members help raise others' offspring is central to determining why these complex social systems form. We studied flight calls ($N = 1917$) from nine social groups of cooperatively breeding superb starlings, *Lamprolornis superbus*, to determine if starlings use vocal cues for kin recognition. Call repertoire similarity was inversely correlated with geographic distance between individuals, and the pitch and duration of calls were significantly similar among group mates. Using playbacks, we found that starlings reacted differently to same- and extra-group calls, singing less and fleeing more during extra-group treatments. Our results show that group members use similar flight calls and that starlings can discriminate amongst calls from different groups. Thus, vocal cues could provide a reliable mechanism of kin recognition, which may allow starlings to direct parental care towards relatives, thereby enabling helpers to gain indirect fitness benefits and reinforcing the structure of starlings' complex social system. (6573)

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THE WESTERN SLATY ANTSHRIKE (THAMNOPHILUS ATRINUCHA) SHOWS THE FIRST EVIDENCE OF CONTINUOUS, AGE-RELATED SONG MORPHOLOGY IN BIRDS

Recent studies have used songs to explore species limits and ecological divergence in suboscines, yet their assumption that songs are immutable remains untested. Over five years, we repeatedly sampled loudsong from known-age Slaty Antshrikes and found that age is negatively associated with trill rate in both sexes. Though singing behavior differs between young and old individuals in many bird species, our data represent the first evidence of continuous, age-dependent vocal structure for any vertebrate. We used the correlation to estimate ages of >200 individuals and discovered that males pair with younger females. Given no sex-biased survival, this pattern is likely generated by intense sexual selection. We constructed age-distributions of breeders—with *Limnodynastes swainsonii* are floodplain-associated breeding birds in the southeastern U.S. To better understand the broad- and fine-scale habitat characteristics that govern the distributions of these birds in large river floodplains, we combined extensive surveys of riparian birds and biotopes in Georgia with landcover data in parallel analyses habitat affinity. Our predictor variables included landscape metrics and measured habitat characteristics suggested by published studies of the species' breeding ecology. We used presence/absence response variables in a hierarchical logistic regression modeling framework with information-theoretic model selection. None of the landscape predictor variables explained patterns of Swainson's Warbler occurrence much better than any other. Both of the best models in the Prothonotary Warbler analysis included a measure of open water-wetland edge density, suggesting this is an important landscape feature for the species. In an analysis with quadrat-level cover classes as predictors, the best model for Swainson's Warbler included only percent cover of leaf litter. This model predicted a 16-fold increase in the probability of Swainson's Warbler occurrence for each 10% increase in leaf litter coverage. (6610)

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POST-BREEDING PUBLIC INFORMATION USE IN A GROUND-NESTING SONGBIRD COMMUNITY

Territory selection in birds is a critical decision because of its large and immediate fitness consequences. Public information (PI) can reveal territory quality to prospecting birds by exhibiting the current inhabitant's reproductive success. I am conducting a playback experiment to investigate PI use in a ground-nesting songbird, the veery (*Catharus fuscescens*), and its effect on heterospecific ground-nesters. I hypothesize that veery fledgling calls produced during the post-breeding season are PI cues used by veeries and heterospecifics for territory selection in subsequent

breeding seasons. In 2009, fledgling calls and silent controls were broadcast at plots during the post-breeding season. Response data was collected and methods were replicated during summer 2010. The final data collection will occur in 2011. Results to date show that the greatest plot occupancy by veeries occurred at fledgling call plots, but this is not significant after a single season. In contrast, heterospecifics responded to controls over fledgling call plots. In conclusion, current data suggest veeries show a trend towards using PI for breeding territory selection, while heterospecifics are not using PI produced by veeries as hypothesized. (6369)

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GENETIC DIVERGENCE DISTINGUISHES ATLANTIC AND PACIFIC POPULATIONS OF THE NORTHERN FULMAR, BUT NOT COLOUR MORPHS

We tested two hypotheses based on a multi-gene phylogenetic analysis of the Northern Fulmar (*Fulmarus glacialis*): i) Atlantic and Pacific populations of the Northern Fulmar represent independent evolutionary lineages, and ii) colour polymorphisms are dictated by mutations in the melanocortin-1 receptor gene (MC1R). We sampled specimens collected from Alaskan Islands and the Chukchi Sea ($n = 48$) and from the Canadian Arctic, Iceland, Faeroe Islands, and Norway ($n = 65$). We sequenced five molecular markers, including two mitochondrial (control region and COI) and three nuclear (CHD1-Z, MC1R, and Myoglobin intron II). Mitochondrial markers provided clear delineation between Atlantic and Pacific birds. Control region sequences were much more variable than COI, but neither marker exhibited population structure within either ocean. Both CHD1-Z and Myoglobin intron II were highly conserved and polyphyletic. MC1R was more variable, including many non-synonymous mutations, but its phylogeographic pattern was not concordant with that of mitochondrial markers. MC1R sequences suggest eastern Atlantic birds are basal and that oceanic populations might intermix. Known light and dark morph birds failed to correlate to any amino acid substitutions in MC1R. (6376)

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TRANSLOCATION, EXPLORATORY MOVEMENTS AND VACANCY FILLING IN TUAMOTU KINGFISHERS

We conducted an experimental translocation of the critically endangered Tuamotu Kingfisher (*Todiramphus gambieri*) on Niau Atoll to study movement behavior and inform conservation planning. We captured and radio-marked mated pairs. One bird from each pair was translocated to a reintroduction site on the opposite side of the island, and the other pair-member was released on the home territory. We used intensive tracking and Brownian bridge movement analyses to compare behavior of translocated and home ranging individuals. Home ranging birds remained on territories and used habitats disproportional to availability. Vacancies on donor territories that were created by the removal of individuals for translocation were filled in 1–10 days. Translocated mates made multiple long distance forays to explore the surrounding landscape, and then they returned to the translocation release site after each movement. Translocated kingfishers used habitats in proportions similar to availability and the exploratory behavior resembled that of dispersing juvenile birds. Our results indicate that translocation is a potentially useful conservation strategy for the Tuamotu Kingfisher, and that dispersal theory may provide foundations for predicting movements of translocated birds. (6451)

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TESTING THE ROLE OF PATCH OPENNESS AS A CAUSAL MECHANISM FOR APPARENT AREA SENSITIVITY

We propose that some apparently area-sensitive species are actually responding to how open a habitat patch is, rather than to patch size. We tested this hypothesis

for Bobolinks (*Dolichonyx oryzivorus*) and found that Bobolink density and occupancy showed significant relationships with openness, but models based on an openness occupancy threshold had greater explanatory power. Thresholds remained approximately consistent from June through August, and shifted to be more open in September. We found no relationships between measures of body condition (body mass, body size, circulating corticosterone levels) and either openness or area. Our findings have implications for studies of area sensitivity, especially with regards to inconsistencies reported within species. Specifically, whether or not a study finds a species to be area sensitive may depend on whether small open sites were sampled, observed densities at the largest sites, and whether a linear or threshold relationship was modeled. Openness measures may have applications for predicting effects of habitat management or development, such as adding wind turbines, in open habitat. Responses to openness may be a consequence of habitat selection mediated by predator effects. (6443)

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COMPARATIVE OSTEOLOGY OF THE ENIGMATIC LONG-WHISKERED OWLET OF PERU

The Long-whiskered Owl, *Xenoglaux loweryi*, occurs only in elfin forest on two remote mountain ridges in northern Peru. Discovered in 1976, this small owl was described the following year in a monotypic genus by John O'Neill and Gary Graves. They noted that, in spite of its peculiarities, *Xenoglaux* most closely resembled *Glaucidium* (which includes many Neotropical species) and perhaps especially *Micrathene*, a monotypic genus that accommodates *M. whitneyi* of subtropical and tropical arid habitats in Mexico and southwestern United States. We compared the skeleton of *Xenoglaux* with those of all other genera of small and medium-sized New World owls, defining 34 characters in which *Xenoglaux* differs from one or more of the comparative specimens. Using a parsimony approach with relationships shown by bootstrap values, we created a phylogenetic tree with our osteological characters. Our data indicate that *Micrathene* is indeed the closest living relative of *Xenoglaux*. (6436)

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INCREASED NUMBERS OF OLFACTORY RECEPTORS IN BLACK AND TURKEY VULTURES

Among the New World vultures, Turkey Vultures rely on olfaction to locate food, while Black Vultures, like most birds, do not appear to rely on olfaction for foraging. To understand the genetic and genomic changes that might be involved in shifting from a reliance on visual to olfactory cues, we examined the olfactory receptor gene family in Black and Turkey Vultures, as well as an outgroup. Olfactory receptors represent the largest gene family in vertebrates, but numbers of olfactory receptors are known to vary substantially among organisms, ranging from ~100-2000 among different vertebrate taxa (with approximately 500 in the chicken genome). As expected, our estimates of the number of olfactory receptors in the outgroup to the vultures was similar to that of the chicken. In addition we found that the Turkey Vulture had more than 3x the number of olfactory receptors as the chicken. Interestingly, the Black Vulture was intermediate between these two taxa, suggesting the increase in olfactory receptors may have preceded the shift to relying on olfaction in the Turkey Vulture. (6574)

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THE IMPORTANCE OF EARLY-SUCCESSIONAL HABITAT TO FLEDGLING MATURE-FOREST BIRDS

Declines in populations of mature-forest birds have caused concern among conservationists and managers. Studies of young birds after they have fledged from the nest indicate that many forest birds use scrub-shrub habitats during the postfledging period, and some even appear to select scrub-shrub habitats over mature forest habitats. Since it is known that habitat selection during the post-fledging period can affect fledging survival, and potentially population viability, it is conceivable that mature-forest bird populations might benefit from the creation of scrub-shrub habitats, despite potentially negative effects of edges on nest suc-

cess. Using published and unpublished data on fecundity as a function of clearcut edge and fledgling survival as a function of habitat structure within regenerating clearcuts we modeled population viability for simulated landscapes with and without clearcuts. We found that when edge effects on nest success were modest, population viability increased with the proportion of clearcuts on the landscape for some forest-nesting species. These results suggest clearcuts can improve population viability of forest birds under certain scenarios. (6410)

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SPATIAL POPULATION DIFFERENTIATION IN THE FACE OF GENE FLOW WITHIN A HYBRID ZONE: TOWHEES IN MEXICO

Hybrid zones offer natural experimental settings in which we can observe the evolutionary processes of differentiation and gene flow. Two species of towhee, *Pipilo maculatus* and *P. ocai*, interact across two well-documented hybrid gradients in central Mexico. Specimens of both species and their hybrids have been collected along these Teziutlán (~1200km, 11 locations, 167 total specimens) and Transvolcanic (~700km, 10 sites, 295 total specimens) gradients. AFLP loci and DNA sequence data reveal both low levels of long-distance bi-directional introgression as well as differentiation among both parental and hybrid swarm populations. The two sides of this gene flow/ differentiation coin are most interesting when considering the complex spatial construct of this hybrid zone. The Teziutlán gradient habitat is more ribbon-like down the backbone of the Sierra Madre Oriental while the Transvolcanic gradient habitat consists of volcanic peak islands. The distinct population structure within the center of the hybrid swarms could be correlated with these distinct spatial signatures of the habitat. (6552)

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MONITORING THE EFFECTS OF INSECT OUTBREAKS ON BIRD POPULATIONS USING CITIZEN SCIENCE DATA

Dealing with large Citizen Science databases, including not only the well-known Breeding Bird Survey (BBS) and Christmas Bird Counts (CBC) but also Project Feederwatch and eBird run by the Lab of Ornithology, can be challenging, requiring considerable computational skills and statistical expertise. Nonetheless, overcoming these obstacles can be rewarding, since these sources offer information on avian populations on both a temporal and spatial scale unmatched by even the most energetic professional researchers. Here I briefly summarize results of three studies using Citizen Science data to quantify the effects of insect outbreaks on bird populations, including (1) the relatively modest effects of gypsy moth outbreaks in the northeastern US on woodpecker populations; (2) the more dramatic effects of the current emerald ash borer invasion on woodpeckers and nuthatches in the Detroit region; and (3) the unexpected effects of periodical cicada emergences on avian populations in the eastern and central US. In some cases, these analyses have yielded insights into population effects eluding more regional studies, highlighting the benefits of having data encompassing large geographic scales. (6491)

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TESTING THE UTILITY OF A BREEDING PRODUCTIVITY INDEX DERIVED FROM MIST-NETTING DATA

Estimates of seasonal breeding productivity, derived from the ratio of juvenile to adult captures, assume similar age-specific capture probabilities. We tested this assumption in 2009-2010 in Guanica State Forest, Puerto Rico. For each focal species we evaluated three data structures: single site-single year, single site-multiple years, and multiple sites-single year. There was equivocal support for equal age-specific capture probabilities for Puerto Rican Bullfinches, but no support across

all data structures for Bananaquits. Data were insufficient to test this hypothesis for Adelaide's Warblers except with single site-multiple years data. The majority of birds were unavailable for capture or became unavailable (temporary emigration = 0.95-0.99). Telemetry results indicated the majority of individuals were available for capture, being re-detected in the study area on days of net operation. Net avoidance was prevalent as exhibited by low recapture rates. Results suggested that estimates of productivity based on unadjusted

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NO-ANALOG BIRD COMMUNITIES UNDER CLIMATE CHANGE

Bird species have responded to climate-change by shifting their distributions to higher altitudes within montane regions and higher latitudes in northern temperate regions. When examined at a community level, latitudinal responses are not uniform with larger bodied and more broadly distributed species responding more readily to changing climatic conditions. When climatic niche-tracking is considered, highly idiosyncratic responses and temporal lag structures are evident. Avian latitudinal responses thus contain a unique anthropogenic signature determined by species that are in better position ecologically and geographically to respond to rapid climate change within transformed landscapes. In montane regions, additional factors exist that are likely to define how avian communities are reconfigured. If species are able to shift their distributions to higher elevations, both available land-area and atmospheric pressure decline resulting in smaller ranges and greater physiological stress. Species that occur on taller mountain systems whose ranges are defined by broader vertical extents are likely to be at an advantage. Range losses will be proportional lower and greater variation in physiological adaptations will likely promote successful shifts to higher elevations. (6595)

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THE BOREAL CHICKADEE: A PHYLOGEOGRAPHIC STUDY

The genetic structure of many species in North America is affected by past glacial cycles. A number of studies have looked at the phylogeography of avian species in North America, although few have studied species at a continent-wide scale, and even fewer focus on high-latitude resident species. In this study we examined how the most recent glaciations may have affected the population genetic structure of the boreal chickadee (*Poecile hudsonicus*), a small resident passerine of the North American boreal forests. We evaluated mitochondrial DNA sequences (N=277) and eight microsatellite loci (N=258) from 13 populations across the chickadees' range. The mtDNA data support a clear separation between the eastern and western populations, while the central populations contained a mixture of haplotypes from the two other regions. High genetic diversity was seen in Alaska and Atlantic Canada, which may suggest older populations, and in Ontario and Quebec, likely the result of secondary mixing. The microsatellite data support the separation of Newfoundland from all mainland populations. The results suggest the use of multiple glacial refugia, one in Beringia and one in the east. (6394)

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INDIVIDUAL AND AGGREGATE MOVEMENTS OF WINTER ROOSTING TREE SWALLOWS

During the non-breeding season, Tree Swallows form huge nightly roosts of thousands to millions of birds. In winter along the Gulf Coast, roosts form in either persistent wetland vegetation, or in managed sugar cane fields that are harvested shortly after their arrival. What effect does roosting habitat have on the movement patterns of individual birds from night to night and the movement of roost locations? Initial results from a radio telemetry study of the sugar cane roosting birds indicate a relatively low rate of roost-site fidelity (~60%). Even though roost locations remain stable throughout the harvest, the individuals using each roost are not necessarily the same individuals as the night before. Study of NEXRAD weather radar imagery shows that in wetland roosts, however, roost durations and locations vary from site to site and year to year, but it is unclear why. We plan to repeat the radio telemetry study in wetland roosts to better understand potential

sources of influence on roost-site fidelity. NEXRAD radar imagery can also help us understand the locations and persistence of roosts from year to year. (6351)

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PHYLOGENETICS OF THE MALLARD COMPLEX COMPARING MITOCHONDRIAL AND NUCLEAR TREES

Inferring phylogenetic relationships among species that have undergone rapid radiations is often confounded by stochastic lineage sorting and introgression. While any single locus is often insufficient to resolve such phylogenies, the combination of several loci can provide better resolution. We sequenced the mitochondrial DNA (mtDNA) control region and 5 nuclear (nuDNA) introns for 13 species (≤ 5 individuals/species) within the mallard complex (*Anas platyrhynchos* and allies). The objectives of this study were to provide a comprehensive phylogeny for the mallard clade and to compare results between mtDNA and nuDNA. BEAST AND MEGA5.0 were used to reconstruct our multi-locus and single-locus trees, respectively. We found that mtDNA and nuDNA phylogenies differed in several ways. For example, nuDNA supported a "South Pacific clade" consistent with earlier morphological work but not mtDNA. In addition, nuDNA supported a clade of sexually monochromatic species being sister to the dichromatic mallard rather than a paraphyletic mallard. This study illustrates the importance of using multi-locus data and coalescent methods to test phylogenetic hypotheses when incomplete lineage sorting is rampant. (6381)

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USING BAYESIAN NETWORK MODELLING TO EVALUATE THE SUITABILITY OF ISLANDS FOR A WILD POPULATION OF GUAM MICRONESIAN KINGFISHERS OUTSIDE THEIR HISTORICAL RANGE

The Guam Micronesian Kingfisher (*Todiramphus cinnamominus*) exists only in captivity, as the introduced brown tree snake has made the entire historic range unsuitable. Plans are now underway to release the birds on an alternate Pacific island outside the historic range. We present a generalized Bayesian network model framework for assessing release site suitability for avian translocations. We customized this model to assess the suitability of 240 oceanic islands for hosting a wild population of Guam Micronesian Kingfishers. Model evaluation was based on how well islands met a host of ecological, political and logistical requirements. Little information is known about the ecology of Guam Micronesian Kingfishers in the wild and the Bayesian network model approach provided the flexibility to incorporate knowledge of closely related species and expert opinions into the island selection process. The model identified five suitable islands for establishing wild populations of the kingfishers under both passive and active post-release management strategies. Bayesian network modeling proved to be an efficient and rigorous method of assessing a large number of islands based on a diverse suite of criteria. (6413)

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THE GULF OF MAINE MIGRATION MYSTERY: FILLING IN THE GAPS

Pressure for energy-related development projects has demanded a better understanding of migration throughout the Gulf of Maine region. Results of fall 2009 banding efforts revealed a previously undocumented flyway for an estimated $\frac{1}{4}$ to $\frac{1}{2}$ million songbirds. The formation of a region wide monitoring network in 2010 combined banding, radar, visual surveys, acoustic recording, stable isotope and physiological data sampling, and telemetry techniques to identify key flyways, understand factors influencing birds' migratory decisions, and to document species composition and migration timing. A significant correlation ($r_s = .52$, $p = .002$) between banding and radar data collected at two different island sites suggests that large movements of birds are happening at a broader regional scale than either technique alone would reveal. Birds sampled at Metinic Island (~ 11 km offshore) were maintaining a positive energy budget (plasma triglyceride levels > 2 mmol/L, $p = .0001$) compared to birds captured at inland sites, suggesting that birds making overwater flights maintain greater energy reserves, as one might predict. Expanded monitoring efforts are underway to further elucidate the migratory patterns suggested by these preliminary analyses. (6390)

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SUBLETHAL EFFECTS OF MERCURY ON THE SONGBIRD IMMUNE RESPONSE: AN EXPERIMENTAL STUDY

Mercury is a ubiquitous contaminant with effects that have been documented in many wildlife populations. Studies have predominantly focused on fish, fish-eating birds, and mammals because much mercury pollution is aquatic and these predators have the highest level of mercury exposure. However, recent studies have found comparable blood-mercury levels in insectivorous songbirds. One fundamental endpoint that is still poorly understood is the effect of mercury on the songbird immune response. This is important to determine because if mercury affects the functioning of the immune system, an exposed organism will be unable to mount an appropriate immune response against invading pathogens. This is the first experimental study to test immune function in songbirds in response to sublethal doses of mercury. Using a new flow cytometric method to quantify B cell proliferation, we observed a slight decrease in proliferation in birds exposed to higher levels of mercury. A more detailed, mechanistic understanding of how mercury affects immune function will contribute to policy and legislation designed to protect both wildlife and humans against mercury threats. (6594)

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AVIAN ASSEMBLAGE RESPONSES TO 100-YEAR LOWLAND FOREST ISOLATION IN TAIWAN

We estimated responses of avian assemblage to 100-year lowland forest isolation in Taiwan, a subtropical island with abundant avian biodiversity. We hypothesized that forests isolated by urbanization and agricultural developments may hinder the dispersal of forest-dependant species to cross, causing community disassembly when the habitat is going degraded. Three to four transects (total $N=27$) at each isolated forest and its control site located at continuous forest were sampled to record presence/absence of forest-dependant birds. Distinct differences of avian communities were found between isolated and continuous forests. There is lower Simpson diversity index and species richness at isolated forests. Also, generalists are more dominant than specialists that are prone to avoid open-field matrix at isolated forests. We used variance decomposition technique to identify the relative effects of factors at physical-level, connectivity-level, and landscape-level on determining the community structures of birds in our study areas. Totally 48.87% variance of avian communities was explained by environmental factors. Connectivity-level factors were the most influential ones to explain the variance of avian communities (14.905%), although landscape-level factors also play the role (10.052%). (6528)

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STRUCTURE AND COMPOSITION OF A MANGROVE AVIFAUNA

Florida's mangroves provide habitat for an eclectic mix of species, including some not found elsewhere. For example, five birds have North American ranges limited to the mangroves of southern Florida. Little is known about any of them, which poses an obstacle to effective conservation. We conducted extensive surveys in Florida's mangroves during 2008-2010 to quantify distribution and estimate breeding-season abundance of mangrove landbirds. Widely distributed species of temperate origins were numerically dominant; the only endemic that was both abundant and widespread was Florida Prairie Warbler (*Dendroica discolor paludicola*). Black-whiskered Vireo (*Vireo altiloquus*) was less abundant but was found throughout the mangroves. White-crowned Pigeon (*Patagioenas leucocephala*) and Cuban Yellow Warbler (*Dendroica petechia gundlachi*) were detected only in the Florida Keys and on the islands of Florida Bay, but were found in high densities where present. Mangrove Cuckoo (*Coccyzus minor*) was found throughout the mangroves but occurred at very low density and at only a small percentage of survey points. Given its overall rarity, and evidence of recent population declines, Mangrove Cuckoo should be a priority for future research and conservation efforts. (6550)

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THE POPULATION STRUCTURE OF BROWN PELICANS IN THE GULF OF MEXICO

Brown pelicans (*Pelecanus occidentalis*) are a high-profile symbol of the ecological well-being of the Gulf of Mexico. This species suffered steep population declines in the mid-1900's and was completely extirpated from Louisiana in 1963. From 1968 to 1980, individuals from Florida populations were introduced to Louisiana and the species was eventually removed from the endangered species list in 2009. Our objective was to assess whether a genetic signature of this introduction event is detectable in contemporary Louisiana populations, and determine the genetic structure of the species across the Gulf region. Using nine polymorphic microsatellite loci on 10 sampling areas from Texas to Florida, we found evidence for two distinct populations: one Louisiana population and one spanning Texas to Florida. This population structure may be best explained in light of management actions from 1968 to 1980. Our findings suggest brown pelicans are largely philopatric, but they do exhibit moderate levels of dispersal between populations. These findings have implications for management of this species in the face of rapid breeding habitat loss and exposure to oil from the Deepwater Horizon event. (6489)

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GREAT-TAILED GRACKLE POPULATION DYNAMICS AND NEST SURVIVAL ALONG AN URBANIZATION GRADIENT IN CITIES OF NORTHERN TEXAS

High densities of Great-tailed Grackle populations in the cities of north central Texas are considered nuisances in both residential and commercial regions. For managing this urban wildlife conflict, city wildlife officials need more information regarding variations of populations and nest survival within urban habitats. To my knowledge, no studies have evaluated the intricacies of this. Therefore, during 2011 I estimated wintering grackle densities and plan to estimate breeding season densities and nest survival in three cities varying in human population sizes: Dallas (1.2 million), McKinney (130,000), and Sherman (39,000). Each city was divided into concentric circles representing core, middle, and peripheral sections based on human urbanization levels. Wintering 2011 densities (grackles/km²; SE) were 2620.8 (999.0), 817.9 (472.8), and 177.8 (136.7) for Dallas, McKinney, and Sherman, respectively. Densities increased with increasing human population but did not vary by section within each city. However, increased density does seem to be associated with proximity to garbage containers. Based on wintering and breeding season results, urban planning recommendations will be made to help reduce human-grackle conflicts. (6597)

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THE INFLUENCE OF MIGRATION INTENSITY AND WEATHER ON AVIAN FATALITIES AT COMMUNICATION TOWERS IN ARKANSAS

Avian collisions with communication towers have been reported for several decades, and mass fatality events involving more than 100 individual birds have been associated with inclement weather. We investigated the influence of four communication tower attributes: physiographic region, tower height, tower lighting system, and the presence/absence of guy wires. We sampled 28 randomly-selected tower sites between 2005 and 2008 and recovered 193 carcasses and 156 feather piles representing 62 species. Tall towers (>150 m) yielded significantly more birds (0.423 birds/search day) than short towers (0.094 birds/search day). In this presentation, we investigate the additional impacts of weather and migration intensity on these data to determine if fatal collisions are associated with certain weather conditions or the number of migrants present during the night prior to tower searches. Weather variables were identified and gathered from archives most proximate to study tower locations. Relative migration intensity was estimated from archived NEXRAD Level II reflectivity data on clear nights at three stations covering much of the state of Arkansas. (6467)

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GENOMIC ANALYSIS OF THE HYBRID ZONE BETWEEN KING AND CLAPPER RAILS

Speciation in birds occurs via allopatry, where geographically isolated populations diverge genetically and phenotypically to the point of reproductive isolation. Ecological speciation occurs when this process is accelerated by adaptations to different environmental conditions. Clapper Rails only breed in saltmarshes, and King Rails breed in freshwater marshes. Where these two habitats interdigitate along the coasts of the Atlantic and the Gulf of Mexico, the two species come into contact and hybridize in a narrow zone of brackish marshes. We collected 20 birds away from the hybrid zone and used next-generation sequencing to find differences across the genome. A third of loci with fixed differences aligned near genes involved in osmoregulation. Analyzing 192 loci under an Isolation with Migration model we detected high bidirectional migration. We fit clines to genetic markers sequenced for 115 additional birds collected across the zone, as well as morphological and ecological data, and found steep transitions and striking concordance among clines. Adaptation across the genome to differences in salinity appears to be preventing the fusion of these recently diverged species. (6500)

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CONSISTENT RARITY OF RED AND ORANGE CAROTENOID PLUMAGE IN NEW WORLD NINE-PRIMARIED OSCINE SONGBIRDS

Carotenoid pigments that are the basis of the reds, oranges and yellows of many songbirds are consumed and deposited in integumentary tissues directly or first metabolically altered, then deposited. Our phylogenetic work on New World blackbirds (Icteridae), has shown that red and orange are rare plumage colors, whereas yellow is common. We explored this distribution on a larger scale, examining the plumage of four families closely related to the Icteridae: Parulidae, Emberizidae, Cardinalidae and Thraupidae. We used reflectance spectrometry to measure museum specimens and quantified the occurrence of red, orange and yellow among 300 species. Yellow was the most common carotenoid plumage color, found in 234 species. Red and orange were both consistently rare, occurring in 49 and 28 species respectively. Yellow carotenoids are common in the avian diet, whereas red carotenoids are believed to be rare. Furthermore, red carotenoid pigments may be physiologically costly, as many birds metabolically alter yellow dietary carotenoids to create red carotenoids. It is not clear why orange should be consistently more rare than red. Our ongoing biochemical analysis in orioles will address this question. (6501)

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NIGHTINGALE REED-WARBLER SURVEYS IN THE MARIANA ARCHIPELAGO

The endangered Nightingale Reed-warbler (*Acrocephalus luscini*) is endemic to the Mariana Archipelago. It has been extirpated from 4 of the 6 islands of its known range, Guam, Aguiguan, Pagan, and Tinian, representing a loss of at least 2 subspecies. Island-wide point-transect surveys were conducted in 2007 on Saipan, in 2008 on Tinian and Aguiguan, and in 2010 on Alamagan and Pagan. Occupancy analysis was used to evaluate habitat characteristics on Alamagan. Playback surveys were conducted on Aguiguan in 2008 and on Pagan in 2010. No Nightingale Reed-warblers were detected on Tinian, Aguiguan, or Pagan. Saipan surveys estimated 22.0 birds per km², representing a >50% decrease in density since 1982. The Alamagan population has remained relatively stable over the past 10 years with a density estimate of 19.5 birds per km². The species' use of habitat on Saipan and Alamagan differs. A declining population on Saipan and the species' limited distribution increases its vulnerability to extinction. Conservation of the species will require stabilization of the Saipan population and the re-establishment of at least three additional populations in the archipelago. (6479)

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DIVERSIFICATION RATES AND PHENOTYPIC EVOLUTION IN THE NEO-TROPICAL SEED-EATERS (GENUS SPOROPHILA)

Neotropical seed-eaters and seed-finches in the genera *Sporophila*, *Oryzoborus* and *Dolospingus* are widely distributed song birds that are well known for their impressive vocal displays. Using mtDNA, we infer a well-supported phylogeny that we subsequently use to examine evolutionary patterns of song, plumage and morphology. Numerous hypotheses exist regarding the interplay of these phenotypic traits, many of which we evaluate here. We find support for the 'transfer hypothesis,' represented by a negative correlation between song and plumage elaboration. Previous studies have found support for a constraint of bill size and shape on trill rates in song birds, however, we fail to observe such correlations in our data. We also quantify an accelerated diversification rate observed within a clade of nine species, known colloquially as southern capuchinos. Furthermore, we uncover coincidental rate shifts in phenotypic traits, suggesting an evolutionary constraint in bill morphology and diversifying selection in certain song and plumage characters of both males and females. (6437)

http://www.bio.sdsu.edu/pub/burns/Student_Research.html

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RESPONSE OF BREEDING BIRDS TO FOREST CHANGES ON MANAGED PLOTS IN THE OZARK MOUNTAINS, ARKANSAS.

Uneven-aged thinning of deciduous forests has been used to mimic natural disturbances and promote habitat heterogeneity, which favors a variety of breeding birds. The objective of our study was to investigate the long-term effects of such practices on bird communities and populations in oak-hickory forests in Arkansas. We compared species richness for forest bird communities and occupancy estimates for two bird species, Ovenbirds (*Seiurus aurocapillus*) and Indigo Buntings (*Passerina cyanea*), which represent two nesting guilds (ground and open, respectively). We found that species richness was similar on managed and non-managed plots fifteen years post-management. Ovenbird occupancy stayed relatively stable, while Indigo Bunting occupancy decreased. The differences in occupancy between plots with various management histories were maintained through time, although these differences were more diminished with Indigo Buntings in 2008. These results indicate that uneven-aged thinning favors an early successional species, and not a mature forest species. In addition, the effects of forest management, even less intense management such as uneven-aged thinning, persist for at least fifteen years, and perhaps even longer. (6616)

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EFFECTS OF WEATHER AND CLIMATE ON THE BREEDING DISTRIBUTION OF THE RUSTY BLACKBIRD

The Rusty Blackbird (*Euphagus carolinus*) is among the most rapidly declining bird species in North America, yet reasons for its decline remain unknown. Some researchers have hypothesized that climate change is a factor in the declines, but no study has examined the response of Rusty Blackbird populations to natural variations in weather and climate. We used the Breeding Bird Survey and regional and global climate indices calculated as surface temperature and pressure anomalies from the 30 year mean to assess the influence of weather and climate on the breeding distribution of the Rusty Blackbird across its range. We found that the mean breeding latitude of the Rusty Blackbird was significantly positively correlated with the Pacific Decadal Oscillation with a lag of six years. Because the Rusty Blackbird is negatively affected by the warmer and dryer conditions produced by the Pacific Decadal Oscillation, our results support the hypothesis that directional climate change is partly responsible for the decline of the Rusty Blackbird over the past 40 years. (6448)

McDermott, M. E., The Ohio State University, USA, mcdermott.95@osu.edu; MATURE FOREST BIRD USE OF SILVICULTURAL HARVESTS IN THE CENTRAL APPALACHIANS.

We investigated avian use of two-age harvests and clearcuts during the breeding and post-breeding periods in West Virginia in 2005-2006. Mature forest songbirds were flexible in their use of different seral stages during breeding. Several species used older (19-26 years) and, to a lesser extent, young harvests (<10 years) as well as mature forest, which may be influenced by our heavily-forested landscape. During post-breeding, vegetative cover rather than food resource variables best explained habitat use in young clearcuts and two-age harvests; e.g., vegetative complexity had a strong positive relation with capture rates of mature forest birds and molting adults, as well as physical condition, which supports a predator-avoidance hypothesis for habitat use. Physical condition and molt status may in part drive bird habitat use during this period, and we found evidence for age-specific differences which may impact survival. We also examined post-breeding bird responses to stand size, edge, and retained basal area. Late-successional birds reached their peak totals and richness in high-leave two-age stands. Area sensitivity was evident, as mature forest bird captures were negatively related to stand size, but edge effects were inconclusive. Although we did not estimate habitat-specific survival, our study provides evidence that young harvests (4-7 years post-harvest) may be valuable to mature forest birds in the post-breeding period and support many nesting individuals after a short regeneration period. (6441)

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MIXED-SPECIES FLOCKS IN SHADED MONOCULTURES AND SILVOPASTURE IN THE COLOMBIAN ANDES

Shade agroforestry systems provide habitat for a diverse assemblage of resident and migratory birds in the Andes. However, shaded crops are being rapidly converted to more structurally simple land uses such as pasture. Reductions in habitat complexity are likely to impact mixed-species flocks, but little is known of the relative value of silvopasture to flocking birds. In Jan-Feb 2011, we recorded species composition, flock size, and individual foraging heights for 146 flocks in the central Andes of Colombia. We sampled shade-coffee, shade-cardamom, and silvopasture (i.e., pasture with remnant trees) at ~1,400-1,700 m elevation. Habitats did not significantly differ in flock size or species richness, although silvopastures tended to support smaller, less diverse flocks. Proportion of males in flocks was lower in silvopasture for several Neotropical migrants. Foraging heights were lower for most migrant species and heights were more narrowly distributed within flocks in silvopasture. Across all habitats, flock size and richness were positively related to vegetative structural complexity. Future field seasons will attempt to better resolve how agroforestry practices differ in habitat quality for Andean forest birds. (6396)

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DEMOGRAPHIC CONSEQUENCES OF MIGRATORY STOP OVER: LINKING RED KNOT MASS GAIN AND SURVIVAL TO HORSESHOE CRAB SPAWNING

Understanding how events during one period of the annual cycle carry over to affect demographics in other periods is essential to understanding migratory bird conservation needs. Previous research has suggested that western Atlantic red knot (*Calidris canutus rufa*) populations are greatly affected by horseshoe crab (*Limulus polyphemus*) spawning at Delaware Bay stopover sites during their spring migration. We present a mass-based multistate, capture-recapture/resighting model linking (1) red knot stopover mass gain to horseshoe crab spawning abundance and (2) subsequent apparent annual survival to mass state at the time of departure from the Delaware Bay stopover area. We used capture-recapture/

resighting data with over 16,000 captures or resightings collected in Delaware Bay from 1997-2008, and the results are used to evaluate the management hypothesis that red knot conservation can be influenced by horseshoe crab harvest regulations. Model selection statistics supported a positive relationship between horseshoe crab spawning abundance and red knot mass gain. Our analyses supported the link between red knot mass and apparent annual survival, although average estimates for the two mass classes differed only slightly. The addition of arctic snow depth as a covariate influencing apparent survival improved model support. Our results indicate that managing horseshoe crab resources in the Delaware Bay could improve red knot population status. (6607)

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A REAL MURDER OF CROWS: HANDICAP-MEDIATED TAKEOVER OF BREEDING POSITION IN LONG-LIVED AMERICAN CROWS

Cooperatively breeding American Crows typically find breeding positions by filling vacancies left by deceased neighbors, inheriting the territory on the death of parents or a sibling breeder, or budding a territory off the natal one. Here we report acquisition of breeding status through direct murder of breeders. A breeding male was found dead with a crow-bill-sized hole at the base of the skull, typical of corvids pecking to kill vertebrate prey. Another male who had joined a neighboring family was observed fighting with the breeding male and delivering severe blows to the back of its head. The older crow was seen once subsequently, and likely succumbed soon thereafter. Both defeated males had survived infections causing the loss of a foot. We suspect the lack of leverage with the loss of a limb allowed the males to be pinned in a vulnerable position which resulted in their death. Males handicapped by survivable injuries have been shown to lose paternity in their subsequent broods. Injuries may occasionally present situations for direct murder as a route to breeding status for subordinate individuals. (6653)

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THE CHALLENGE OF DELIMITING RECENT LINEAGES: THE LIGHT-VENTED/TAIWAN BULBUL (PYCNONOTUS SINENSIS/TAIVANUS) COMPLEX AS A CASE STUDY

Historical lineages are widely regarded as important components of biological diversity. However, delimiting lineages is a challenge when divergence is recent because character concordance is expected to be low. In this study, we used mtDNA in conjunction with plumage characters to delimit recently evolved lineages within the Light-vented/Taiwan Bulbul (*Pycnonotus sinensis/taivanus*) complex. Lineage hypotheses based on mtDNA and morphology differed, but could be combined to form a reconciled hypothesis of four lineages. We attempted to validate these four lineages using 13 nuclear loci and a new coalescent-based species delimitation method implemented in the program BPP. This produced mixed results, as BPP assigned a low speciation probability to the Taiwan Bulbul, which is very distinct morphologically. Further, we found that BPP had a tendency to assign high speciation probabilities to arbitrarily defined geographic clusters of populations, suggesting the method may be prone to over-splitting in the presence of population substructure. We conclude that multiple kinds of characters are necessary to identify lineages when divergence is recent and that methods for validating lineage hypotheses using incompletely sorted nuclear characters should be used with caution. (6486)

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CITIZEN SCIENCE MEETS POLICY: THE 2011 U.S. STATE OF THE BIRDS REPORT ON PUBLIC LANDS AND WATERS

The 2011 State of the Birds Report uses citizen science to inform conservation policy. This report overlaid modeled occupancy of habitat obligate birds on USGS-GAP's Protected Areas Database of the U.S. to assess the distribution of U.S. birds on public lands. Occupancy was predicted from checklists collected by eBird, a citizen science program. Statistical models associated eBird data with environmental factors, including land cover, elevation, local climate, and housing density. Public ownership was defined as lands and waters managed by the Departments of Interior, Agriculture, Defense, and other federal and state agencies. More than 300 habitat obligate birds had 50% or more of their U.S. distribution on public lands. Obligate birds in Arctic/Alpine, Boreal, Pine-Oak, and Western Forests, and Aridlands had the highest percentage of their distributions on public lands; Eastern Forests and Grasslands had the lowest. Birds on islands (e.g., Hawaii) are particularly dependent on public lands. Similarly, publicly managed waters significantly impact oceanic and coastal birds. Public lands are critical to conserving birds; citizen science-based analyses can have a long-term impact on public lands management and associated policies. (6476)

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UNDERESTIMATING HABITAT NEEDS OF SHORT-TAILED HAWKS DUE TO NEST-FINDING BIAS.

Sound quantitative estimates of avian habitat needs are vital to ecological research and conservation planning. Characterizations of nesting habitat are particularly important, yet nest detections are often biased by limitations on physical, visual, and legal access to nest sites. The U.S. population of Short-tailed Hawks is extremely small and limited mainly to peninsular Florida, within which they breed and winter. Nesting occurs in mature, mixed-species swamp forest. We compared nest sites found using visual and audible cues near recent observations ("sighted", n = 16) with sites found by tracking adult females that had been radio tagged on their winter range ("tracked", n = 14). Tracked nests had a broader geographic distribution and were significantly more likely to be surrounded by less urban development and more forest than sighted nests. Tracked nests also were significantly farther from urban areas and deeper within the forest stand. These results led to substantial revisions of our habitat and spatial recommendations for this rare species, which is being considered for federal listing. Nest-searching biases should be assessed in any study of avian habitat needs. (6630)

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CONSERVATION AND MONITORING CHALLENGES IN THE LARGEST REMAINING POPULATION OF FLORIDA SCRUB-JAYS.

Ocala National Forest supports the largest remaining Florida Scrub-Jay (*Aphelocoma coerulescens*) population. However, the status and trend of scrub-jays in this crucial population remain uncertain because of unique challenges stemming from forest management practices and monitoring limitations. Harvest rotations for sand pines sustain the scrub-jay population by continually creating openings in the scrub but also limit the potential carrying capacity for the region. The sheer size of the region (>90,000 ha of sand pine and oak scrub) limits the applicability of traditional color banding and monitoring methods used with scrub-jays elsewhere in the state. Development of a long-term monitoring protocol is critical so the U.S. Forest Service can effectively evaluate management actions. Limitations of previous population estimates, ranging from 700 to 900 family groups, are discussed as well as recent assessments using occupancy modeling. Finally, data collected with a new monitoring protocol are presented and discussed in the context of addressing questions about the relationship between scrub-jay demography and landscape attributes such as stand size and age. (6549)

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 CRYPTIC DIVERSITY IN SIX PANAMANIAN FOREST BIRDS: DEEP DIVERGENCES, SHARED CONTACT ZONES, & ABRUPT MTDNA TURNOVER WITH INITIAL INSIGHTS FROM MULTI-LOCUS DNA

I present detailed phylogeographic data for six widespread forest birds from the Caribbean lowlands of Panama (*Mionectes oleagineus*, *Schiffornis turdina*, *Thryothorus nigricapillus*, *Henicorhina leucosticta*, *Arremon aurantiostris*, and *Cyanocopsa cyanoides*). These species share the following phylogeographic tendencies: deep divergences between mtDNA clades, shared contact zones in western and east-central Panama, incongruence with subspecific taxonomy, and abrupt turnover of mtDNA lineages across narrow contact zones. These patterns are consistent with what would be expected from cryptic species, and in fact, levels of mtDNA divergence for these six species are equal to, or exceed, divergence levels among many species pairs that replace each other over the same two contact zones. However, evidence from nuclear DNA fragments indicates non-trivial levels of gene flow for some of these six species across abrupt mtDNA breaks, suggesting that additional data are required in order to infer species limits in cases of deeply-divergent, reciprocally-monophyletic mtDNA clades. (6629)

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USE OF VIDEO-MONITORING TO STUDY NESTING ECOLOGY OF RED-SHOULDERED HAWKS IN SUBURBAN CINCINNATI, OHIO

We studied a large population of Red-shouldered Hawks (*Buteo lineatus*) inhabiting suburban areas around Cincinnati, Ohio. This suburban population of the eastern subspecies of Red-shouldered Hawks nests in woodlots and yards near houses, and is well-adapted to human disturbance. We used 24-hour video cameras mounted above or near nests to record adult and nestling behaviors, causes of nest failure, and prey deliveries. Mounting the cameras during the courtship phase, after the adults occupied the nest and lined it with green vegetation, did not disturb the birds, as all pairs laid eggs in the nests with cameras. Causes of nest failures in this population included eastern gray squirrel (*Sciurus carolinensis*), Great Horned Owls (*Bubo virginianus*), and raccoons (*Procyon lotor*). Prey delivered to the nests included small mammals, frogs and other amphibians, snakes, and invertebrates, indicating that suburban Red-shouldered Hawks are generalist predators, as are Red-shouldered Hawks nesting in more typical remote forested regions. (6514)

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WHITE TAIL SPOTS ENHANCE FORAGING PERFORMANCE AND PROVISIONING OF NESTLINGS IN THE HOODED WARBLER

The outer tail feathers of Hooded Warblers (*Wilsonia citrina*) have conspicuous white spots that the birds reveal by regularly flicking their tails during foraging. I tested the hypothesis that the white spots enhance foraging performance by means of a field experiment conducted at Hemlock Hill Field Station in NW Pennsylvania. Fourteen pairs were captured at their nests while feeding nestlings. At seven nests, the white outer tail feathers of males and females were temporarily darkened with a marking pen. Birds at the other seven nests were sham-darkened to serve as controls. Results strongly support the foraging performance hypothesis; birds with darkened tails had significantly lower prey attack rates and made significantly fewer feeding visits to the nest than did sham-darkened controls. These results, similar to those obtained recently for *Myioborus redstarts*, suggest that white tail spots and tail-flicking behavior function to startle potential insect prey that the warblers then pursue and capture in flight. The results also serve as a reminder that plumage "ornaments" found in many species of birds may serve functions other than social or sexual signaling. (6397)

<http://webpub.allegheny.edu/employee/r/mumme/Research/Research.html>

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SURVIVAL ESTIMATES FOR PEREGRINE FALCONS BREEDING IN SOUTHERN SCOTLAND

The peregrine falcon (*Falco peregrinus*) population in Britain has largely recovered from declines caused by organochlorine pollutants, but population continues to decline in some areas. Changes in prey availability, persecution, density-dependent effects and perhaps environmental contamination may be affecting local populations of peregrines. Despite substantial research focus, information on peregrine demography and recruitment are generally lacking. We captured, marked and followed 133 adults and 813 nestlings between 2002 and 2010, and applied multistate mark-recapture models to estimate and model survival. For known-age breeding males and females, mean age was $8.4 \text{ yrs} \pm 4.6$ ($n=22$, $\text{max}=17$ yrs) and $7.3 \text{ yrs} \pm 3.5$ ($n=58$, $\text{max}=14$ yrs), respectively. Model-averaged estimates ($\pm \text{SE}$) of survival rates ranged from 0.70 ± 0.11 to 0.73 ± 0.11 for adult males, and from 0.76 ± 0.0 to 0.79 ± 0.05 for adult females. Survival of juveniles ranged from 0.04 ± 0.02 to 0.05 ± 0.03 for males, and from 0.05 ± 0.02 to 0.06 ± 0.03 for females. Mean natal dispersal was 48.4 km (0-209 km; $n=8$) for males and 79.9 km (11-104 km; $n=11$) for females. (6453)

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EXTRAPAIR FERTILIZATIONS IN EASTERN KINGBIRDS PROVIDES GOOD GENES FOR OFFSPRING

We use three years of data from Eastern Kingbirds (*Tyrannus tyrannus*) breeding in Oregon, USA, to test four hypotheses that have been proposed as explanations for why female birds seek extrapair fertilizations (EPF). Eight microsatellite showed that 61% of females ($N = 89$) had ≥ 1 EP partners. Hatching success increased slightly as the number of EP sires increased, but fledging success and recruitment were independent of number of EP sires. Comparisons of nestling size and heterozygosity between EP and within pair (WP) young in all nests or only nests of mixed paternity yielded only one difference: EP maternal half-sibs were larger than WP nest mates. Unexpectedly, WP young were more likely to recruit than EP young. This was attributable to the high recruitment of young sired by males with high WP and high EP mating success. Offspring of males with low WP and low EP mating success had a low probability of recruiting. Our data are inconsistent with predictions of the genetic diversity and genetic compatibility hypotheses, modestly support the fertility insurance model, but strongly support the hypothesis that females seek EP fertilizations to acquire good genes. (6639)

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EVALUATION OF THREE METHODS TO ESTIMATE DENSITY AND DETECTABILITY FROM ROADSIDE POINT COUNTS

Point count data not adjusted for detection probability can lead to incorrect trend estimates. We compared precision of detectability and density estimates for bobwhite counts from roadside surveys in Ohio using distance sampling, double-observer, and removal methods. We compared models that included covariates for distance, year, and observer effects. The best models of detectability included observer and year effects for distance sampling and observer and distance effects for removal and double-observer techniques. All three methods provided precise estimates of detectability ($CV = 2.4\text{--}4.4\%$) with a range of 0.44 to 0.95. Density estimates from double-observer surveys had the lowest coefficients of variation (1.7-3.2%) followed by removal method (3.4-4.8%), and distance sampling (7.9-9.6%). Assumptions of distance sampling were violated because of inaccurate distance estimation and placement of survey points along roadsides. Although double-observer surveys provided more precise estimates, we recommend the removal method for monitoring bobwhite because it provided precise estimates and requires half the personnel time as double-observer surveys. Also the likelihood of meeting model assumptions is higher for the removal method than double-observer surveys. (6386)

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GLOBAL CLIMATE CHANGE DIFFERENTIALLY AFFECTS THE TIMING OF ARRIVAL OF TWO POPULATIONS OF HUDSONIAN GODWITS, LIMOSA HAEMASTICA, ON THEIR BREEDING GROUNDS

Global climate change has led to mismatches between the timing of breeding in migratory birds and the peaks in their food resources. Because these mismatches are likely caused by events occurring prior to the breeding season, I use two populations of Hudsonian Godwits, *Limosa haemastica*, to explore potential intra-specific differences in arrival patterns, whether both local-scale weather and large-scale climate variables affect godwit migration, and which portions of the pre-breeding period are most related to arrival date. I found that the southcentral Alaska godwit population is arriving 8.89 days earlier than 37 years ago, while the Hudson Bay population is arriving 10.64 days later. Using linear regressions and an AIC selection criteria, I determined that for both populations, the best models included local-scale weather variables occurring at migratory bottlenecks. However, for the Alaska population, the most important variable was the 5-year mean May temperature, while for the Churchill population it was the current year's mean May temperature. These findings suggest significant intra-specific differences that may affect the abilities of these two populations to adapt to future environmental changes. (6362)

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CONSTITUTIVE IMMUNE FUNCTION IN EUROPEAN STARLINGS *STURNUS VULGARIS* IS DECREASED IMMEDIATELY AFTER AN ENDURANCE FLIGHT IN A WIND TUNNEL

Life-history theory predicts that animals face an energetic trade-off between performing strenuous exercise and mounting an immune response. We experimentally tested this prediction by studying immune function in European starlings *Sturnus vulgaris* flown in a windtunnel. Specifically, we predicted that constitutive immune function decreases in response to training, and – additionally – in response to immediate exercise. We compared constitutive immune function among (1) 'Untrained' birds; (2) 'Trained' birds; and (3) 'Post-flight' birds that differed from the 'Trained' group in being sampled immediately after the flight. All three indicators (haptoglobin, agglutination and lysis) showed the predicted decrease in immune function in the Post-flight group, and two indicators (haptoglobin, agglutination) showed the predicted decreasing trend from the Untrained to Trained to the Post-flight group. Haptoglobin levels were negatively correlated with flight duration. Our results suggest that in European starlings, constitutive immune function is decreased more as a result of immediate exercise than of exercise training. Due to the recent emergence of avian-borne diseases, understanding the trade-offs and challenges faced by long-distance migrants has gained a new level of relevance. (6656)

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MALADAPTIVE PARENTAL CARE OR FOOD LIMITATION? EXPLAINING THE VARIATION IN NESTLING STAGE NEST SURVIVAL IN SUBURBAN AND WILDLAND FLORIDA SCRUB-JAYS.

Human modification of habitats can drastically affect reproductive success by creating "evolutionary traps" that mimic natural cues and cause maladaptive behaviors. By manipulating an adult's perception of predation risk and the availability of nestling foods in urban and wildland areas, we were able to test whether these factors influenced parental care, nestling begging and nest survival during the nestling period. Provisioning rates of suburban males and time spent brooding by suburban females were significantly lower when both the perception of predation risk and food abundance was greater; behavior of wildland males and females did not differ among treatments. Suburban nestlings begged less often when food was more abundant, whereas wildland nestling begging was not affected by food

availability. However, site-specific differences in nest survival during the nestling period were not influenced by variations in parental care or food availability, but by the presence of helpers to aid in detecting and deterring nest predators. (6433)

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FACTORS INFLUENCING OR PREDICTING NEST SURVIVORSHIP OF PILEATED WOODPECKERS IN BOTTOMLAND HARDWOOD FORESTS

We present findings on Pileated Woodpecker (*Dryocopus pileatus*; PIWO) nest-site selection in lower bottomland (cypress-tupelo swamps) and higher bottomland habitats (sweetgum-oak forests). Cameras were deployed at 36 of 100 PIWO nests located 2007–2010. We documented 14 predation events (38.9%), resulting in 11 nests destroyed. Logistic-exposure models indicated video cameras did not positively or negatively influence nest survivorship. Although most confirmed predation events occurred in sweetgum-oak forests (68.8%, N=11), there was no significant difference in nest success between habitat types. Our model-selection analyses suggest most of the variation in daily survival rates can be explained by age of nests. In addition, the more cavities present in a nesting snag and nests located within stands with smaller diameter trees were more likely to fail. Therefore, PIWOs are more likely to fledge young if they build new cavities each year within stands containing larger/older trees. Collectively, nest survivorship can be predicted for PIWOs in bottomland hardwood forests. These findings should be considered in developing management schemes for all cavity-nesting species of concern in bottomland hardwood forests. (6560)

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PROXIMAL AND LANDSCAPE HABITAT FEATURES OF TWO WETLAND-ASSOCIATED NEOTROPICAL MIGRANTS IN LARGE RIVER FLOOD-PLAINS OF GEORGIA, USA.

The Prothonotary Warbler (*Prothonotaria citrea*) and Swainson's Warbler (*Limnethys swainsonii*) are floodplain-associated breeding birds in the southeastern U.S. To better understand the broad- and fine-scale habitat characteristics that govern the distributions of these birds in large river floodplains, we combined extensive surveys of riparian birds and biotopes in Georgia with landcover data in parallel analyses habitat affinity. Our predictor variables included landscape metrics and measured habitat characteristics suggested by published studies of the species' breeding ecology. We used presence/absence response variables in a hierarchical logistic regression modeling framework with information-theoretic model selection. None of the landscape predictor variables explained patterns of Swainson's Warbler occurrence much better than any other. Both of the best models in the Prothonotary Warbler analysis included a measure of open water-wetland edge density, suggesting this is an important landscape feature for the species. In an analysis with quadrat-level cover classes as predictors, the best model for Swainson's Warbler included only percent cover of leaf litter. This model predicted a 16-fold increase in the probability of Swainson's Warbler occurrence for each 10% increase in leaf litter coverage. (6610)

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ON THE BACK OF AN ENVELOPE MODEL: A MORE MECHANISTIC APPROACH TO PREDICTING RANGE SHIFTS WITH CLIMATE CHANGE

Most forecasts of species' distributions following climatic changes are based on current correlations between climate and animal ranges. These "envelope models" may describe current relationships well, but we need mechanistic models that predict changes in demographic rates when these correlations break down. We developed a range model for Coastal Plain Swamp Sparrows (*Melospiza georgiana nigrescens*) based on a Markovian seasonal-fecundity model, mark-recapture survival estimates, and four previously described geographic gradients in Emberizid demography. Together this allowed us to estimate population growth for the taxon across the Atlantic Coast of North America. The predicted southern range

boundary was only 50 km from the known breeding limit. We then tested for future range perturbations under increased nest-flooding probability (expected with sea-level rise) and warmer temperatures (which impact egg viability). By increasing these factors singly or in unison, we were able to reduce the predicted range size dramatically. Models like ours, which describe environmental effects on specific demographic parameters and do not assume the maintenance of current abiotic correlations, should more accurately predict the impact of climate change on bird reproduction and distributions. (6533)

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INTROGRESSION AND MITOCHONDRIAL REPLACEMENT FROM BALTIMORE ORIOLE LINEAGE TO BLACK-BACKED ORIOLE CAUSES MISLEADING MITOCHONDRIAL TREE IN NORTHERN ORIOLE GROUP

The Mexican Black-backed Oriole (*Icterus abeillei*) was long considered the sister taxon of Bullock's Oriole based on plumage similarity and apparent hybridization in Mexico. At the 1997 AOU Meetings, Omland and Lanyon presented mtDNA evidence that Black-backed was not closely related to Bullock's but was the sister of Baltimore Oriole. Although a senior ornithologist blurted out: "That's ridiculous!", the support for Black-backed + Baltimore was overwhelming. Subsequent sequencing of multiple individuals from both species confirmed recent mitochondrial divergence. However, we recently sequenced 12 nuclear introns, and the intron evidence strongly supports the traditional Black-backed + Bullock's sister relationship. Coalescent analysis using a three-population IMA2.0 model indicates gene flow between Baltimore and Black-backed in spite of their allopatric breeding ranges. Other lines of evidence suggest that the mtDNA gene tree is explained by mitochondrial introgression from the Baltimore lineage followed by a selective sweep and mtDNA replacement in Black-backed. Although mitochondrial DNA may be the best single locus to use for recent divergences in birds, inferences based on mtDNA alone can be positively misleading. (6432)

<http://umbc.edu/biosci/general/user/omland>

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THE DISTRIBUTION OF PASSERINES DURING THE LATE PLEISTOCENE IN NORTHWEST PERU

The influence of climatic change on the distribution of Neotropical passerines has been a matter of contention among ecologists and evolutionary biologists alike for decades. I am reconstructing a late Pleistocene passerine community by identifying 14,000 year old (last glacial period) passerine fossils from the Talara Tar Seep located in northwestern Peru. These fossils are being used with paleoniche models, that can project back in time 20,000 years ago, to understand where species and their habitats were in northwest Peru in the past. Today, the area around the fossil site is arid, but the passerine fossils and paleoniche models indicate the presence of savanna, grassland, and forests there during the late Pleistocene. Results also suggest that these ecosystems were more extensive in northwestern Peru in the past than they are today. (6638)

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ARE PREDICTORS OF EXTINCTION RISK PARFOCAL?

Many explorations of extinction risk have had a global focus, yet it is unclear whether predictors of risk at broad spatial scales are the same for local scales—i.e., are predictors like a parafocal lens, a lens that need not be refocused if magnification is changed? To explore this question, we used near-annual presence/absence records for a 40-year (1970–2009) data set from Palenque, Mexico, to explore extinction risk of >200 bird species in response to deforestation. We correlated long-term population trends with body size, geographic range, diet, edge sensitivity, taxonomy, and ecological specialization. Several predictors associated with high extinction risk at global scales, such as large body size or small geographic range size, did not apply to our local data. Body size was associated with species loss at Palenque, but both very large and, especially, very small species have declined or disappeared. Decline did correlate with a species' affiliation for forested areas and with complex combinations of diet and foraging strata. Our findings emphasize the importance of local analyses to explicate extirpation risk at various spatial scales. (6389)

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SPECIATION AND HETEROGENEOUS AMONG-LOCUS DIVERGENCE IN THE GREEN-WINGED TEAL (*ANAS CRECCA*) COMPLEX

Speciation is a process whereby drift and selection cause divergence over time. However, there is no rule dictating the time required for speciation, and the process can be hindered by even low levels of gene flow. We conducted comprehensive sampling of mitochondrial DNA (mtDNA) and eight nuclear introns (nuDNA) to estimate genomic levels of differentiation and gene flow between the Eurasian Common Teal (*A. crecca crecca*) and the North American Green-winged Teal (*A. crecca carolinensis*). These taxa are 6.9% divergent in mtDNA control region, with only 1 of 58 *crecca* (1.7%) and 2 of 86 *carolinensis* (2.3%) having haplotypes grouping with the other taxon. Two nuclear loci were likewise strongly structured between *crecca* and *carolinensis* ($\Phi_{st} > 0.35$), but the remaining loci were undifferentiated or only weakly structured ($\Phi_{st} = 0.0–0.06$). This among-locus heterogeneity does not adequately fit simple, neutral models of population divergence. We hypothesize that glacier-induced, cyclical vicariance/secondary contact or selection causing differential introgression can best explain this heterogeneity. This study illustrates that species delimitation using a single marker oversimplifies the complexity of the speciation process. (6548)

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AVIAN AIR STRIKE-RISK SPECIES AND SPECIES OF CONSERVATION CONCERN RESPOND DIFFERENTLY TO GRASSLAND MANAGEMENT AROUND AIRFIELDS IN THE NORTHEASTERN U.S.

Grasslands associated with airfields in the eastern U.S. frequently support breeding populations of regionally important grassland birds, but can also support bird species that are potentially hazardous to aircraft operations. Between 2007 and 2010, we studied the relationships among avian density, grassland habitat management, and vegetation structure on three military airfields in the Northeast during breeding and migration. Models showed that on military airfields that were regularly mowed, aircraft strike-risk bird density was higher on transects with shorter mean vegetation. In contrast, densities of breeding species of conservation concern tended to be positively related to vegetation height. Models examining avian densities within seasons did not strongly indicate that birds were tracking habitat conditions on a small temporal scale. Overall, our results suggest that management practices geared toward minimizing bird-aircraft collisions on airfields may not necessarily be in conflict with efforts designed to encourage less risky, vulnerable species. Because of the variable results observed among our study sites, we also caution that management strategies employed at one installation may be ineffective or detrimental at others, even within the same geographic region. (6637)

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A REMOTE SENSING APPROACH TO ASSESSING KING RAIL HABITAT

Broad-scale spatial habitat models provide a new perspective about landscape patterns and species interactions. In this study, we modeled the distribution of the King Rail, *Rallus elegans*, in coastal marshes of southwest Louisiana and southeast Texas. These Gulf Coast wetlands likely provide a stronghold for this species of concern. To model the habitat suitability of King Rails, we performed six repeated bird surveys at >100 locations per year from 2009–2011. We utilized satellite remote sensing and Geographic Information Systems (GIS) to develop a predictive habitat model for the King Rail. The results showed King Rails responded to different habitat variables in fresh and intermediate marshes. In fresh marshes, rails

had positive relationships with green winter vegetation and wetness while having a negative relationship with semi-permanent water. For intermediate marshes, rails were positively related to green winter vegetation, heterogeneity in vegetation, water-vegetation edge, and semi-permanent water. These associations reflect the ecological niche of King Rails, and future research will compare these results to other secretive marsh bird spatial distributions. These remote sensing models will greatly assist in understanding elusive wetland birds. (6512)

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REGIONAL VARIATION IN RESPONSE TO CLIMATE EXTREMES BY AVIAN COMMUNITIES- PREDICTIONS FOR A NO-ANALOG FUTURE

Under climate change, extreme events are expected to become more frequent and more extreme. The response of birds to extreme events is of keen interest but is largely unknown. Within the conterminous U.S., we used the North American Breeding Bird Survey to estimate the response of avian communities to hurricanes, drought, heatwaves, and interactions among these extreme climate events. We found shifting species distributions indicated both in terms of species richness and of species' abundances. Regional sensitivity to extreme events varied. In the arid southwestern US, where physiological tolerances of bird species are already stressed, our models predicted drought- and heatwave-induced declines in abundance as high as 36% among ground nesting birds. In the southeast US, while the empirical response of birds to hurricanes lasted up to 5 years, changes in bird community due to hurricanes were less severe and mediated by the amount of forest in the larger landscape. Our observed regional variation in bird community response to various abiotic stressors suggests that such investigations may help identify areas most sensitive to the no-analog futures anticipated under climate change. (6628)

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BROWN-HEADED COWBIRD PRESENCE IN RELATION TO AVIAN PREDATOR ABUNDANCE, BROOD HOST ABUNDANCE, AND LANDSCAPE CONDITIONS.

The Brown-headed Cowbird (*Molothrus ater*) is of conservation concern due to its potential influence on the reproductive success of host species. We hypothesized that the presence of cowbirds was associated with diurnal avian predator abundance and host abundance, but that it was most related to landscape conditions because of cowbird food and cover requirements. We studied birds during the cowbird breeding season. We used logistic regression to relate cowbird presence to avian predator abundance, host abundance, and land-cover metrics for six cover types (woodland, grassland, agriculture, developed area, shrub, and wetland). Contrary to our hypothesis, cowbird presence was most associated (positively) with the abundance of diurnal avian predators. Cowbird presence also was positively associated with some agricultural metrics and negatively associated with one grassland metric. The importance of the association between cowbird presence and predator abundance was four times that of the association between cowbird presence and landscape influences. Cowbird presence was not related to host abundance. The positive relationship between cowbird presence and avian predator abundance was consistent with recent reports indicating that brood parasitism may increase nest predation. (6405)

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ELEVATED TESTOSTERONE STIMULATES FEMALE BIRDS TO PRODUCE MORE SONS

Birds have demonstrated a remarkable ability to manipulate offspring sex. Previous studies suggest that treatment with hormones can stimulate females to manipulate the offspring sex prior to ovulation. Specifically, acute and chronic treatments with testosterone stimulated significant skews towards male offspring.

Hormones may act by influencing which sex chromosome is donated by the heterogametic female bird into the ovulated ovarian follicle. However, it is difficult to pinpoint when the effects of testosterone on offspring sex occurred because testosterone treatments did not target the critical period of chromosome segregation. We treated laying hens with testosterone injections 5h prior to ovulation to target this critical period and quantified the sexes of the subsequently ovulated eggs. We hypothesized that an injection of testosterone coincident with segregation of the sex chromosomes would stimulate hens to produce more male than female offspring. As hypothesized, hens injected with testosterone produced a significant bias towards male offspring, nearly 70%. These results suggest that acute testosterone elevation during meiotic segregation may mediate primary sex ratios in birds. (6446)

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DOES CORTICOSTERONE INFLUENCE OFFSPRING SEX IN A DOSE-DEPENDENT MANNER?

Treatments with hormones have stimulated female birds to manipulate offspring sex prior to ovulation, possibly by influencing which chromosome is retained in the oocyte by the heterogametic female. In a previous study, we found that injecting corticosterone 5h prior to ovulation stimulated females to produce 83% male offspring while control oil females produced 62.5% males and untreated females produced 44% males, suggesting that corticosterone may influence offspring sex in a dose-dependent manner. The objective of this current study was to determine if there is a dose-dependent effect of corticosterone on offspring sex. We injected females 4 or 5h prior to ovulation with corticosterone doses that mimicked pharmacological or physiological increases and quantified the sexes of the subsequently ovulated eggs. We hypothesized that females injected with high corticosterone would produce the most male offspring while those injected with low corticosterone would produce an intermediate proportion of male offspring. However, no significant bias was observed when comparing either corticosterone group to the control groups, suggesting that corticosterone influences offspring sex only if the timing and magnitude of corticosterone elevation are sufficient. (6642)

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EFFECTS OF ADULT BEHAVIOR AND NEST-SITE CHARACTERISTICS ON BLACK-CAPPED VIREO NEST SUCCESS

Most studies associate risk of predation with vegetation characteristics of the nest site. Alternatively, the Skutch hypothesis suggests adult activity at nests can attract attention of predators, leading to an increased risk of predation. I investigated whether vegetation characteristics around nest sites affected nest attentiveness and visitation, and if these behaviors affected nest success. I used 1-hr direct observations and 8-hr video observations from Black-capped Vireo nests in Texas, 2008–2010 to quantify nest attentiveness and visitation during incubation and the nestling stage. Vegetation characteristics did not appear to affect nest behavior, though nest attentiveness during incubation increased as average cover 0–2 m increased. Adult activity does not appear to increase risk of nest predation. Despite visitation being higher during the nestling stage than incubation, the probability of a nest succeeding improved as visitation increased in the nestling stage and as male visitation increased during incubation. Overall, the probability of nest success improved as male participation in parental care increased. These results emphasize the importance of male participation in determining the outcome of nests for species exhibiting bi-parental care. (6401)

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FLORIDA SCRUB-JAY NEST SURVIVAL IN THREE LANDSCAPES

Differential nest survival may have important implications for population dynamics in differing landscapes. Depressed nest survival may have immediate demographic consequences (failed fledgling production in the current year), as well as longer carry-over effects on breeder survival and future productivity (due to

increased effort via renesting). We estimated nest survival rates for incubation and brooding stages across 17 years for Florida Scrub-Jay (*Aphelocoma coerulescens*) populations living under three landscape contexts: wild-contiguous, wild-naturally fragmented, and suburban. We assessed breeder experience and the presence of cooperative helpers and modeled various temporal patterns (i.e. year, season or nest stage trends). Daily nest survival rates differed between sites, with the lowest average survival in suburban habitats in both the incubation and nestling stages. There was strong support for a quadratic temporal pattern and notable decline in daily survival probability late in the season. The presence of helpers was more important than female or male experience. Taken with other demographic data, nest survival within a landscape context may provide insights into both the current and future demography of local populations. (6555)

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'PSEUDOCONGRUENCE' AND 'PSEUDOINCONGRUENCE' IN THE COMPARATIVE PHYLOGEOGRAPHY OF NORTH AMERICAN BOREAL FOREST BIRDS.

Comparative phylogeography aims to understand the degree to which currently codistributed species share a common history, but may be complicated by phylogeographic 'pseudocongruence' (congruent genetic patterns structured by discordant histories) or 'pseudoincongruence' (differences in modern genetic structure despite a shared history). We present original genetic data for Blackpoll Warblers (*Dendroica striata*), and infer the number and location of glacial refugia by combining statistical coalescent analyses with GIS-based paleodistribution models. We then use these methods to reanalyze published DNA datasets for three additional codistributed boreal forest species, and reevaluate the congruence of species responses to Pleistocene climate cycles. Blackpoll Warblers, Yellow-rumped Warblers (*Dendroica coronata*), and Dark-eyed Juncos (*Junco hyemalis*) exhibit congruent demographic patterns with unstructured haplotype networks and single refugia. However, this may represent phylogeographic pseudocongruence, as paleodistribution models suggest these species were not codistributed at the last glacial maximum (LGM). Swainson's Thrush (*Catharus ustulatus*) differs from the others in that it persisted in two refugia, but was likely codistributed at LGM with Blackpoll Warblers in the east, and Yellow-rumped Warblers in the west, representing a case of phylogeographic pseudoincongruence. (6428)

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SHOREBIRD MIGRATION IN WESTERN KENTUCKY: PHENOLOGY, HABITAT USE, AND POSSIBLE EFFECTS OF PREY AVAILABILITY

Little is known about the use of wetlands by migrating shorebirds in Kentucky. During 2004 and 2005, I examined the phenology of migration and habitat use of shorebirds using stopover habitats in Kentucky, and also examined possible relationships between prey availability and habitat selection. Twenty-five species and 12,307 individual shorebirds were observed at three wildlife management areas, with Killdeer (*Charadrius vociferous*; N = 4134), Pectoral Sandpipers (*Calidris melanotos*; N = 2912), Least Sandpipers (*Calidris minutilla*; N = 1138), Greater Yellowlegs (*Tringa melanoleuca*; N = 942), and Lesser Yellowlegs (*Tringa flavipes*; N = 911) being most abundant. Wet mud was the most common foraging microhabitat (2832 of 11936 observations, or 23.7%), and the presence of shallow water best discriminated between sites where shorebirds were observed foraging and randomly selected sites. Although used by shorebirds in my study, such habitat was not always available during migration. Because both natural and managed wetlands provide stopover sites for shorebirds during migration in Kentucky and, given many species are declining, it is important that wetlands be preserved and better managed and that additional habitat be created. (6352)

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THE ROLE OF EXTREME WEATHER IN THE BREEDING PROBABILITIES OF AN ENDANGERED BIRD

An individual's breeding probability can be viewed as a sensitive indicator of the decision to initiate reproductive behavior, which is the first step in a life-history trade-off between allocating resources for breeding activities (e.g. courtship) or maximizing self survival. Although a great deal of work focuses on estimating parameters of reproductive output (e.g. nest success), few studies exist which

test hypotheses about the observed variation in the breeding probabilities of a naturally occurring avian population, an important reproductive parameter commonly assumed to be equal to one for adult individuals. As extreme weather patterns are expected to become more severe and more frequent, understanding their impacts on the vital rates of endangered populations is of increasing interest to both evolutionary ecologists and conservation practitioners. We present evidence of disproportionate effects of extreme weather conditions (drought) on the age-specific breeding probabilities of an endangered avian population, the Florida snail kite (*Rostrhamus sociabilis plumbeus*). The results of which contradict hypotheses about reproductive restraint and inferences based on known patterns of reproductive output. Our analysis accounts for the misclassification of breeding status assignment, an assumption frequently violated when states are based on field observations. (6658)

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A TEST OF THE SWAINSON'S WARBLER HABITAT SUITABILITY INDEX MODEL.

We tested a Habitat Suitability Index (HSI) model developed for the Swainson's Warbler (*Limnethlypus swainsonii*; SWWA). The HSI consists of a combination of six variables: landform, landcover, successional age class, forest patch size, proportion forest in a 1-km radius, and small stem density (<2.5 cm diameter breast height). We collected field data on SWWA presence and absence at the White River National Wildlife Refuge and Big Island, Arkansas and calculated HSI scores using the proposed model. HSI scores were lower for occupied (0.66; N=99) locations than unoccupied (0.77; N=158; p = 0.006). Further, estimates of SWWA abundance were not correlated with HSI scores at Saint Francis National Forest (r² = 0.06, F_{1,17} = 1.23, P = 0.28) and at White River National Wildlife Refuge there was a slight negative relationship between SWWA abundance and HSI scores (r² = 0.35, F_{1,6} = 3.27, P = 0.12). Our test of the SWWA HSI model indicated that it is not currently an effective predictor of SWWA habitat suitability in our study areas. We offer a new suitability function indexing elevation relative to seasonal flooding that might improve model performance. (6618)

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MULTI-SCALE ANALYSES OF NEST SITE SELECTION AND REPRODUCTIVE SUCCESS IN CLAPPER RAILS.

Resident tidal marsh birds must minimize risks from both predation and regular tidal flooding to reproduce successfully. Nest site selection represents a trade-off between conflicting strategies to avoid these two main risk factors. We studied mechanisms for addressing these trade-offs in nest site selection by the Clapper Rail (*Rallus longirostris*) across two years in South Carolina. At the landscape scale, rails selected nest sites that experienced significantly lower seasonal maximum tides compared to alternative sites. At the local scale, rails likely mitigated predation risk by nesting at sites with significantly taller and denser vegetation compared to alternative sites. Rails selected nest sites closer to water's edge than alternative sites, potentially increasing vulnerability to flooding. However, based on the rails' selection at the landscape scale, we suggest this risk was minimized. Nest survival probabilities decreased as distance to non-marsh habitat (e.g., pine woods) decreased. Thus, despite rails' apparent ability to select sites minimizing flooding risk, they appeared not to select for a proximity to non-marsh habitat (i.e., a nest predator source); any increase in proximity reduced overall nest survival probabilities. (6605)

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DO OVERALL LEVELS OF NEST PREDATION AFFECT OUR ABILITY TO DETECT DENSITY-DEPENDENCE IN WATERFOWL, AND CAN HAVING CLOSE NEIGHBORS BE BENEFICIAL?

When nest predation levels are very high or very low, the range of variation in nest success is necessarily constrained (a floor/ceiling effect). Hence, researchers

might be more likely to detect density-dependent predation in years experiencing moderate predation rates, simply because there is greater variation in nest success. We tested this hypothesis by conducting an artificial nest experiment when predation levels were intermediate, and comparing our results to an identical study conducted in 2000, when predation levels were very high. We found no evidence for density-dependent nest predation on artificial nests in either year, indicating that density-dependence does not operate at the spatial scale of our experimental replicates (20-40 ha fields). We also found no evidence of nearest neighbor effects for artificial nests. However, when we conducted nearest neighbor analyses on natural nests, we found that nest success increased as nearest neighbor distances decreased, and that neighbors were likely to share the same nest fate. Hen nest site selection behavior, especially conspecific attraction, may account for the differences observed between artificial and natural nests. (6406)

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MICROFILARIAE AND TRYPANOSOME INFECTIONS IN FLORIDA SCRUB-JAYS (*APHELOCOMA COERULESCENS*)

We studied the seasonal and spatial patterns of microfilaria and trypanosome infections in the federally Threatened Florida Scrub-Jay (*Aphelocoma coerulescens*) and assessed the effects of parasitism on survival and reproduction. From February-September 2010, 64% of adult scrub-jays ($n=104$) and 39% of juveniles ($n=145$) were infected with microfilariae, while 17% of adults and 19% of juveniles were infected with trypanosomes. A subset of juvenile birds recaptured during the winter had significantly lower mean microfilariae intensity than during the previous summer ($n=27$), indicating a possible synchrony with the emergence of hematophagous arthropod vectors. Juveniles who became infected with microfilariae and trypanosomes were from territories with a greater proportion of wet habitat ($n=77$). The mean intensity of trypanosomes and microfilariae did not influence the winter survival of adults or juveniles. However, the reproductive success (measured as number of offspring surviving to day 80) of adult birds decreased significantly with both prevalence and mean intensity of microfilariae ($n=22$). Although blood smear examination is the most common method for avian parasite identification, we found that centrifuged capillary tubes provided enhanced sensitivity and efficiency. (6452)

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THE EFFECTS OF WATERFOWL IMPOUNDMENTS ON SORA AND VIRGINIA RAIL POPULATIONS

Freshwater wetlands have experienced steep declines in North America. Wetland habitat loss threatens species that breed in these wetlands including sora (Porzana carolina) and Virginia rail (*Rallus limicola*). A common management technique for creating new wetland habitat is the impoundment of aquatic areas. The effects of waterfowl impoundments have been studied for waterfowl and shorebirds but remain untested for rails. Rails nest close to the water surface and are susceptible to flooding and predation as a result of fluctuating water levels. The more stable water levels of impoundments could be beneficial for rails by decreasing nest predation but impoundments could also have a negative impact by increasing nest flooding. Our current data is from one very dry summer in Maine. Nesting success ($n=53$) in wetlands with waterfowl impoundments was significantly higher than wetlands without these impoundments due to decreased nest predation rates. (6542)

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THE EFFECT OF WINTER RAINFALL ON SPRING ARRIVAL DATES AND REPRODUCTIVE SUCCESS IN THE ENDANGERED KIRTLAND'S WARBLER

Understanding how animals will adapt to global climate change requires understanding how climate variables influence their biology year-round. Migratory

birds may be especially vulnerable due to the wide range of geographic areas that they depend on throughout the annual cycle. This study examines the potential effects of non-breeding season climate change on the Kirtland's warbler (*Dendroica kirtlandii*), an endangered songbird that breeds in northern lower Michigan and winters in the Bahamas. Our objectives were to determine whether late winter rainfall carries over to affect spring arrival dates, and whether this has consequences for reproductive success in the subsequent breeding season. We sampled many individuals in multiple years to show that male Kirtland's warblers arrive on breeding grounds later following drier winters. There was a strong age by rainfall interaction, indicating that second-year males were much more sensitive to changes in rainfall than adults. Arrival schedule is biologically important, because delayed arrival was associated with delayed nest initiation and fewer offspring fledged. Significant drying trends in the Caribbean are predicted by several climate change models. Any resulting adjustments to the timing of migration could constrain arrival dates and limit reproductive success of the endangered Kirtland's warbler, as well as other Neotropical migrants wintering in the Caribbean. (6604)

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DYNAMIC SELECTIVE ENVIRONMENTS AND EVOLUTIONARY TRAPS IN HUMAN-DOMINATED LANDSCAPES

In highly-modified environments certain ornamental traits may not longer act as honest signals of quality. Using Northern Cardinals as a model, we hypothesized that urbanization would alter the relationship between plumage coloration and reproductive success. From 2006-2008, we measured plumage color, monitored reproduction, and quantified habitat within territories in Ohio, USA. In rural landscapes, the brightest males bred earliest and secured preferred territories with exotic and carotenoid-rich honeysuckle. However, annual reproduction of rural males declined with brightness. Coloration of urban males was not associated with territory attributes or reproduction. Female redness across all landscapes was negatively related to reproduction. Poor reproductive performance of otherwise higher quality males likely resulted from preferences for honeysuckle, which reduces annual reproduction when used as a nesting substrate early in the season. Thus, exotic shrubs prompted an evolutionary trap that was avoided in urban forests where anthropogenic resources disassociated male color and reproductive phenology and success. Our study illustrates how modified selective environments in human-dominated landscapes might shape microevolutionary processes in wild bird populations. (6444)

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MULTIPLE HABITAT USE, CORRIDOR BEHAVIOR AND DIURNAL MIGRATIONS BY NEOTROPICAL MIGRANT WARBLERS AT JOBOS BAY, PUERTO RICO

We sought to determine whether individuals of multiple species of migrant warblers (non-nesting residents) use red mangrove, black mangrove and secondary dry forest in Jobos Bay, Puerto Rico. Fixed-radius point counts revealed several species in all three habitat types. Observations from blinds established in gaps between mangrove and dry forest within two hours of sunrise and sunset revealed nearly unidirectional movement by several species tree-hopping through the corridor from mangroves after sunrise and to mangroves before sunset. Mist netting revealed diurnal migrations in Prairie Warblers, Northern Waterthrushes, Yellow Warblers, Northern Parulas, Western Palm Warblers, and male and female American Redstarts, and that this movement was more intense shortly before sunset. One nesting resident, Adelaide's Warbler, was commonly observed nearby in dry forest and an adjacent mangrove fringe but not in the corridors. The non-nesting Ovenbird, and nesting, migratory Black-Whiskered Vireo were detected only in dry forest. No species was detected only in mangroves. These results underscore the importance of secondary dry forest to this avian guild, despite the preference by most species for mangroves as nighttime roosts. (6481)

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URGENT CONSERVATION NEEDS FOR THE FLORIDA GRASSHOPPER SPARROW

The Florida Grasshopper Sparrow (*Ammodramus savannarum floridanus*) is an Endangered subspecies endemic to dry prairie of south Florida. This ecosystem has been reduced to <19% of its former extent. Only three sparrow populations remain on public lands: Avon Park Air Force Range, which is near extirpation; Kissimmee Prairie Preserve State Park, which has declined substantially since 1998; and Three Lakes Wildlife Management Area, which has declined more recently. Little direct evidence exists to suggest causes of recent declines but likely explanations include: 1) encroachment by woody vegetation, 2) reduced nest success and habitat alteration from cattle grazing, 3) nest predation by non-native ants, and 4) interactions between altered fire regimes, hydrology, and climate. Several management tools appear to benefit Grasshopper Sparrows including prescribed burns on an interval of 1-3 years and removal of trees and shrubs, but direct links between management activities and demographic responses remain uncertain. With <500 birds likely remaining and information gaps on the causes of population declines, captive breeding and translocations may become necessary; however, research is needed to develop successful techniques for this subspecies. (6649)

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HARVEST, WEATHER AND POPULATION DYNAMICS OF NORTHERN BOBWHITES IN SOUTH FLORIDA

Hunting pressure can be intense on public lands. Winter additive harvest may have contributed to the decline of a northern bobwhite population of south Florida. We used demographic parameters estimated from a 6-year study to evaluate the role of harvest and weather conditions on the bobwhite population decline. The population growth rate (0.144) was proportionally more sensitive to adult winter survival and survival of fledglings. All harvest scenarios consistently revealed a substantial impact of harvest on bobwhite population dynamics. If the lowest harvest level recorded in the study period (i.e., in 2008) was applied, the population growth rate would increase by 32.1%. Winter temperatures negatively affected winter survival, and precipitation acted synergistically with harvest in affecting winter survival. Thus, reduction in winter survival due to overharvest has probably been an important cause of the bobwhite population decline, but weather factors might have also played a role. An adaptive harvest management strategy that considers weather conditions in setting harvest quota might help reverse the population decline. (6488)

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FORAGING BEHAVIOR OF BLACK-BACKED WOODPECKERS IN BURNED FORESTS AND MOUNTAIN PINE BEETLE INFESTATIONS

Black-backed Woodpeckers (*Picoides arcticus*) are a species of management concern throughout their range, and knowledge of factors affecting habitat quality can direct effective conservation decisions. Food availability is a critical component of habitat quality since it affects fitness attributes such as survival and reproductive success. We evaluated vegetation characteristics associated with foraging to identify which resources were correlated with increased feeding rates of Black-backed Woodpeckers in the Black Hills of South Dakota. We conducted

10-minute foraging observations, counting the number of foraging attempts at each tree the woodpecker used. We modeled foraging rates using a negative binomial generalized linear mixed model. Foraging rates were greatest on severely burned trees and in mountain pine beetle infested trees that had been infested at least three years. Additionally, foraging rates were positively correlated with tree diameter. However, foraging rates on mountain pine beetle infested trees were slightly lower than on burned trees. Results suggest that recently burned forests provide greater food resources than mountain pine beetle infestations. However, beetle infestations may provide relatively stable food resources, since foraging rates increased in older infestations. (6395)

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DEMOGRAPHIC RESPONSES OF GREATER PRAIRIE-CHICKENS TO LANDSCAPE FRAGMENTATION

B.K. Sandercock, L.B. McNew, L.M. Hunt, A.J. Gregory, and S.M. Wisely, Kansas State Univ., Manhattan, Kansas, USA. Intensification of agricultural production has impacted grassland and farmland birds worldwide. In east-central Kansas, declining numbers of Greater Prairie-Chickens are thought to be linked to regional changes in rangeland management or land cover. We conducted a 4-year study to examine demographic performance of female prairie chickens at three sites that differed in landscape configuration. High losses to predation led to low survival of nests, broods, and females attending young, and resulted in low productivity. Unexpectedly, the highest rates of productivity but the lowest rates of female survival were associated with greater landscape fragmentation. Demographic rates were synthesized in an age-structured matrix population model. Estimates of the rate of population change (λ) predicted declines, especially at sites with greater fragmentation. Variance-weighted sensitivities consistently indicated that λ was most sensitive to survival of adults and nests. Our results indicate that core populations of prairie-chickens in eastern Kansas are not viable under current rangeland management practices. In new research, we are investigating the potential benefits of patch-burn grazing for conservation of prairie chickens and other grassland birds. (6627)

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LOOKING AT THE BIG PICTURE: SCIENTIFIC USE OF NORTH AMERICAN BREEDING BIRD SURVEY DATA

Analyses of North American Breeding Bird Survey (BBS) data indicate a large amount of pattern in population change of North American birds. Explaining these patterns is challenging, as substantial amounts of pattern in observations are due to nuisance factors such as observer abilities or environmental effects on counting. Geographical and temporal scale considerations also complicate analyses. Although descriptive summaries of pattern of population change are of public interest, scientific interest focuses on explaining pattern. Hierarchical models provide a convenient framework for discriminating among hypotheses about factors influencing population change while accommodating scale and nuisance factors. Integration of BBS data with climate and landuse data to facilitate multi-scale studies is an important component of BBS research and management. We describe ongoing projects that address broad-scale ecological questions using hierarchical models. We estimate composite population change for species groups at several geographic scales. Grassland obligate birds have collectively declined 37% between 1968 and 2010. BBS data index change in bird breeding phenology. We document significant phenology effects on counting for many species, and evaluate hypotheses regarding regional and species-specific differences in phenology. (6463)

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LINKING EARLY LIFE EXPERIENCE, CORTICOSTERONE, AND ADULT BEHAVIOR IN FLORIDA SCRUB JAYS: IMPLICATIONS FOR CONSERVATION

Stressful conditions during development and early life can permanently impact an organism's phenotype. In the threatened Florida scrub-jay (*Aphelocoma coerulescens*), parental care was negatively correlated with nestling levels of corticosterone (CORT, the avian stress hormone). Nestlings with higher CORT had higher "fearfulness" scores at eight months of age and nestling levels also predicted CORT levels at one year of age. In adult jays, prebreeding CORT levels predicted both whether they would use a novel feeder and their nest attendance behavior some three months later. Further, maternal nest attendance positively affects fledging success, a measure of fitness. Together, these data suggest a relationship between early life experience, nestling CORT, adult CORT, and behaviors that could impact fitness. The factors that underlie nestling CORT levels are many and studies investigating the roles of parental behavior, resource availability, habitat structure, and inheritance are underway. Understanding how early life conditions and physiological state impact adult phenotype and subsequent fitness has broad implications for conservation and can inform captive breeding, translocation, and habitat management plans. (6561)

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USING BIRD SPECIES OCCURRENCE TO PRIORITIZE OLD FOREST RESTORATION

Conservation planners often focus on 'ecologically intact' habitats with little human influence, but this is not feasible where all historic habitat has been lost or degraded, such as in BC's densely populated Georgia Basin, where just 0.3% of old growth Coastal Douglas fir forests (>250 yrs) remain. We used replicated point counts (N=350) in a 1,560 km² study area, remote-sensed data and program PRESENCE to predict habitat occupancy in 18 native birds. We next used expert elicitation to rank species as old-forest indicators to produce a composite map of habitat likely to support forest-reliant bird communities and suitable for old-growth restoration. Our predictions were positively related to the size of old forest (>100 yrs) tracts identified independently in air photos and to plot-level estimates of native plant species richness, and were negatively linked to the occurrence of exotic birds and plants indicative of human-influence. We offer a repeatable method to prioritize forest-reliant bird communities and habitats that, in combination with carbon 'off-set' programs, identifies cost-effective targets for old-growth restoration in landscapes with few or no examples of historically important habitats. (6623)

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DEMOGRAPHIC RATES AND ENERGETICS OF RED KNOTS WINTERING IN FLORIDA.

The *rufa* subspecies of red knot (*Calidris canutus*) has undergone drastic declines in the last 25 years. We compared the Florida population to the greater subspecies to determine if declines had a local demographic component. Estimates of annual survival rates between Florida birds and their South American counterparts between 2005 and 2010 were similar (FL = 0.86-0.94 vs. SA = 0.87-0.92). Florida birds had similar or higher body mass. Plasma metabolites of Florida birds were consistent with a slightly positive energy budget, indicating maintenance not starvation conditions. We also modeled local residency and movement rates among three sites in the greater Tampa Bay region as a function of prey, body mass index, and distance. Knots remained in traditionally used areas unless conditions (e.g., human recreation) changed markedly. Transition probabilities between areas were minimal (*rufa* populations). (6510)

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CONCORDANCE OF GENETIC AND PHENOTYPIC CHARACTERS ACROSS A HYBRID ZONE OF RED-BREASTED AND YELLOW-BELLIED SAPSUCKERS

Sapsuckers that are geographically separated but hybridize with each other where they come into contact, presented a unique system for the study of speciation and hybridization. We provide a comprehensive analysis of phenotypic and genetic variation across the only known hybrid zone between the east-west species pair of sapsuckers, the red-breasted (*Sphyrapicus ruber*) and yellow-bellied (*S. varius*) sapsuckers, to infer whether the phenotypic variation, which informs their current taxonomic status explains genetic variation. We looked at morphometric and plumage traits, and two molecular markers across this contact zone in north-eastern British Columbia. Both phenotypic and genetic characters showed clear differences between the forms and concordant clinal variation across the contact zone. Cline centers are positioned at ~50km west to the crest of Rocky Mountains. Hybrid genotypes are common in the contact zone, however they were less common than expected under random mating and no selection. The zone width was narrower than would be expected under neutrality. Therefore we further conclude that this hybrid zone is maintained by strong selection providing an illustrative example of extensive hybridization between stable entities. (6599)

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VOLATILE AND SEMI-VOLATILE COMPOUNDS IN GRAY CATBIRD UROPYGIAL SECRETIONS VARY WITH AGE AND BETWEEN BREEDING AND WINTERING GROUNDS

The uropygial gland secretions of birds contain volatile and semi-volatile compounds that are believed to serve as chemical signals. We used a pair of extraction methods—solid-phase microextraction headspace sampling and solvent extraction—with gas chromatography-mass spectrometry to detect and identify volatile and semivolatile chemical compounds in uropygial secretions of Gray Catbirds. We identified linear and branched saturated carboxylic acids from acetic (C2) through hexacosanoic (C26); linear alcohols from decanol (C10) through docosanol (C22); one aromatic aldehyde; one monounsaturated carboxylic acid; two methyl ketones; and a C28 ester. Juveniles produced greater amounts of volatile C4 through C7 acids and semivolatile C20 through C26 acids, although the variation among individuals was large. Adults produced significantly higher levels of long-chain linear alcohols than juveniles. We also found that the heaviest carboxylic acids were significantly more abundant in secretions from birds sampled on Florida wintering grounds, whereas methyl ketones were more abundant in birds sampled during summer on the Ohio breeding grounds. In addition, we found a significant effect of sex on levels of carboxylic acids (C4 through C7) in juveniles. (6534)

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INTERANNUAL TERRITORY, MATE AND NEST SITE FIDELITY IN ACADIAN FLYCATCHERS

Birds that breed in more than one season have the opportunity to change regions, sites, territories, mates and nest sites from one nesting season to the next. Between 2004-2007 we banded and monitored 39 mated pairs of Acadian Flycatchers as part of a larger study on birds in urban and exurban landscapes. In the subsequent breeding season we looked for four possible outcomes: neither individual returned (N=14), only one of the pair returned (N=14), both returned and paired together (N=10), or both returned and did not pair (N=1). After accounting for apparent survival estimates (males = 0.52 [0.4-0.6]; females = 0.33 [0.23-0.46]), it appears that Acadian Flycatchers exhibit high levels of mate fidelity across breeding seasons. During this study we observed several instances (N ≥ 4) of specific nests sites being reused across breeding seasons. These observations

were surprising as nest site reuse is uncommon in open cup nesters and because Flycatcher nests are structurally weak and generally do not persist across seasons. We suspect that nest site reuse may be underreported. (6457)

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MECHANISMS AND EFFECTS OF OIL CONTAMINATION ON MIGRATORY SHOREBIRDS IN THE GULF OF MEXICO.

Several species of migratory shorebirds use the northern Gulf of Mexico, the site of the 2010 Deepwater Horizon oil spill, as migratory stopover and wintering habitat. Habitat degradation from oil exposure could affect shorebird populations, and potentially carryover to affect ecosystems where these shorebirds breed. We measured oil exposure in six species of shorebird captured at six different locations varying in oiling intensity and one species from a stopover site in Canada prior to exposure. Nineteen of 219 individuals captured at wintering and stopover sites had visible signs of oil with a greater number of oiled individuals found in the more heavily oiled sites. We are adapting a commercially available immunoassay for detecting polycyclic aromatic hydrocarbons (PAHs), compounds found in crude oil, to quantify PAH levels in avian plasma, fecal samples, foraging substrate, and invertebrate prey. (6535)

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MATERNAL INVESTMENT IN MOUNTAIN PLOVER EGG VOLUME

Studies of the rapid multi-clutch mating system of the Mountain Plover (*Charadrius montanus*) have suggested differences between male- and female-tended clutches in both nest and chick survival. One explanation for these differences may be differential maternal investment in the eggs laid in male-tended clutches. To explore possible differences we modeled the volume of plover eggs in male- and female-incubated clutches. In addition, the effects of day of nest initiation, year, and prairie dog colony were also included in the model. We measured 567 eggs from 194 nests of 131 females and 620 eggs from 213 nests of 148 males. Egg volume was calculated using the equation $[(0.4482 \times \text{Egg Length} \times \text{Egg Width}^2) - 0.269]/1000$. Male-incubated eggs tended to be larger than those of females (male volume = 13.20 cm³, SE = 0.03; female volume = 13.17 cm³, SE = 0.04) and this effect was strong ($p = 0.04$). Day of nest initiation was also significant ($p = 0.02$), with volume decreasing throughout the season. This study provides further information about parental investment in the uncommon mating system of a species of conservation concern. (6591)

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STOPOVER DURATION AND DEPARTURE DECISIONS OF NORTHERN WATERTHRUSH AND YELLOW-RUMPED WARBLER DURING SPRING MIGRATION

Although migratory schedules influence arrival timing and reproductive success in breeding areas, little is known about the factors that determine stopover duration in avian migrants. We investigated how intrinsic and extrinsic factors mediate stopover duration and probability of departure. In spring 2009-2010, we captured transient Northern Waterthrushes (NOWA) and Yellow-rumped Warblers (MYWA) at Trempealeau NWR, Wisconsin, USA. We translocated radio-tagged individuals and measured minimum stopover duration (MSD). MSD was $4.0 \pm 0.4d$ ($n=31$) for NOWA and $4.0 \pm 0.5d$ ($n=25$) for MYWA. Linear models indicated decreasing MSD with date in NOWA and increasing MSD with date in MYWA; MSD decreased with increasing energetic condition across species. Classification models predicted higher nightly departure probabilities with easterly winds across species, with warmer temperatures and later dates for NOWA, and with decreasing barometric pressure and earlier dates for MYWA. These results suggest both species are on a faster time schedule as the breeding season approaches; condition and date may determine stopover duration while weather influences the precise night of departure. The relationship between energetic condition and stopover duration highlights the importance of conserving high-quality stopover habitats. (6582)

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CARDIAC MORPHOLOGY AS AN INDICATOR OF HYPOXIC STRESS IN HIGH-ANDEAN BIRDS

A few species of birds such as the House Wren (*Troglodytes aedon*) and Rufous-collared Sparrow (*Zonotrichia capensis*) span the entire elevational gradient of the Andes, providing unparalleled opportunities to study physiological traits associated with high-altitude hypoxia. Low-altitude mammals exposed to hypoxia exhibit pulmonary hypertension that causes right-ventricular hypertrophy, but it is unknown whether birds employ the same compensatory response. We tested whether high-altitude populations of widespread Andean bird species exhibit enlarged right ventricles that would suggest chronic pulmonary hypertension. We found strong evidence of right-ventricular enlargement in high-altitude House Wrens, indicating that House Wren populations in the high Andes may not be optimally adapted to ambient hypoxia. We counted myocyte nuclear density in the ventricular walls and intra-ventricular septa to test whether enlargement of the right ventricle represents genetic adaptation or a plastic developmental response to hypoxic stress. The combined ventricular size and nuclear density results reveal evidence of species-specific patterns of high-altitude adaptation that likely reflect unique biogeographic histories. (6563)

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ALTERNATING EPISODES OF HUMID AND DRY HABITAT CAUSED SPECIATION DURING THE GREAT AMERICAN BIOTIC INTERCHANGE

Three million years ago the uplift of the Panamanian land bridge initiated an unprecedented degree of interchange in previously isolated North and South American faunas, a phenomenon referred to as the Great American Biotic Interchange. The mammalian fossil record indicated that species crossed the land bridge in alternating episodes of humid and dry habitat. However, evidence for contracting rainforests in the Neotropics has been highly controversial and often contradictory. Here, we test the "alternating episode" hypothesis on birds using multilocus divergence time estimates from 29 sister lineage pairs distributed across the Isthmus of Panama. We used these divergence times to develop a temporal model of speciation for both dry and humid biome birds and tested the probability of speciation in alternating episodes. We will discuss how these divergence time patterns can be used to understand how habitat changes impacted speciation in the Neotropics. (6522)

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EVOLUTION OF GEOGRAPHIC VARIATION AND THE FORMATION OF A SONG SPARROW RING.

In a ring species, two neighboring populations that exhibit reproductive isolation are connected to one another by intermediate populations that surround a geographic barrier. Song Sparrows (*Melospiza melodia*) in the western United States are distributed in a geographic ring and might be a ring species. We examined how the Song Sparrow ring formed by assessing the genetics of eight populations found around the ring and testing alternative isolation by distance models. We found support for ring formation via colonization from a southern location and that ecotones and colonization route were important in ring formation. (6506)

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SEXUAL SELECTION IN DICKCISSELS VARIES WITH TIME ACROSS MANAGED HABITATS

Sexual dimorphism is generally thought to result from sexual selection, but the link between dimorphic traits and reproductive success is not always clear. One possible explanation is that sexual selection is inconsistent across time and space. I investigated sexual selection in dickcissels (*Spiza americana*) breeding in managed habitats across two years. Specifically, I examined the relationship between reproductive success and sexually dimorphic traits (song and plumage) in two habitats maintained by frequent or infrequent burning. Frequently burned sites were dominated by grasses and forbs while infrequently burned sites also supported substantial shrub communities. Conditions in 2008 were favorable to dickcissel reproduction, while in 2009 vegetation growth was poor and invertebrate abundance declined substantially. However, an analysis of selection gradients showed that year and habitat had little influence on sexual selection. There were two exceptions to this trend. Year significantly influenced selection on bib size, and habitat significantly affected selection on yellow feather brightness. Nevertheless, variation in time and space cannot fully account for the overall weak links between sexually dimorphic traits and reproductive success in dickcissels. (6513)

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PLASMA TESTOSTERONE CONCENTRATIONS IN ADULT TREE SWALLOWS DURING THE BREEDING SEASON

We studied seasonal profiles of circulating testosterone concentrations among male and female adult Tree Swallows (*Tachycineta bicolor*) breeding in nest-box colonies near Ames, Iowa, USA. Mean plasma testosterone in males was elevated during nest establishment (0.63 ± 0.86 ng/ml) and incubation stages (0.28 ± 0.26 ng/ml) and was significantly lower after hatching (0.03 ± 0.05 ng/ml) when males began provisioning nestlings. Male swallows do not incubate and high testosterone during the incubation stage may facilitate pursuit of extra-pair matings. Female testosterone concentrations were an order of magnitude lower than those of males (nest establishment, mean = 0.06 ± 0.09 ng/ml) and did not change significantly over the breeding season. These testosterone profiles support the hypothesis that elevated testosterone in males is associated with defense behaviors and obtaining additional mating opportunities during the first part of the breeding season, but is incompatible with parental care once the eggs have hatched. (6526)

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CULTURAL IMAGES OF BIRDS - A NEGLECTED SOURCE OF INFORMATION.

Birds are often depicted or mentioned in works of human culture, yet these images and references have been little studied by ornithologists. Some of these works, however, can add to our knowledge of birds or human history. Some prehistoric cave drawings, for example, testify to the former ranges of certain species. Ancient Egyptian hieroglyphs and stone objects show that the Helmeted Guineafowl *Numida meleagris* formerly inhabited northern Africa. Historical references and works of art document the anthropogenic spread of the domestic chicken *Gallus gallus* and Indian Peafowl *Pavo cristatus* from their original areas

in southeast Asia. A Chinese earthenware figure of a guineahen dating from about the 1st century BCE informs us about commerce between the Roman Empire and China. Images of birds in works of art deserve to be considered as potential sources of information about avian or human history. (6371)

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THE EFFECTS OF WIND TURBINES ON OVER-WINTERING GRASSLAND BIRDS. T.K. STEVENS, K. B. KARSTEN, AND A. M. HALE, TEXAS CHRISTIAN UNIVERSITY, FORT WORTH, TX, USA.

Wind energy is the fastest growing form of alternative energy in the United States. Wind turbines can affect birds in a variety of ways, including displacing them from otherwise suitable habitat. Wind turbine displacement has been studied in North American breeding birds, but our study is the first to investigate displacement of a wintering bird community in North America. We surveyed the over-wintering bird community at Wolf Ridge Wind in north-central Texas from December-February in 2009/2010 and 2010/2011. During this time period, we surveyed 210 1 ha area search plots. We recorded 26 different species of birds representing 694 observations. We performed Mann-Whitney U-tests ($\alpha = 0.05$) on all species or ecological groups with sample sizes >18 to determine if birds were being displaced. Distance to nearest turbine did not differ for observations of birds and plots without birds in Savannah Sparrows, Meadowlarks (Eastern & Western), and Sprague's Pipits. Observations of Le Conte's Sparrow were significantly farther from the nearest turbine than plots without Le Conte's Sparrow ($U = 4,556$, $n_1 = 28$, $n_2 = 191$, $P < 0.0001$). (6609)

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NATURAL VARIABILITY IN LEPIDOPTERA ABUNDANCE INFLUENCES CLUTCH SIZE OF BLACK-THROATED BLUE WARBLERS

Food abundance has long been known to influence the reproductive performance of birds. However, explicitly modeling the influence of the natural variability in food on reproductive performance is often difficult because of the challenges in estimating food and the variability associated with such estimates. From 2003 – 2010 we estimated Lepidoptera abundance on four of the most ubiquitous understory saplings at three study sites in the southern Appalachian mountains of North Carolina to determine its influence on clutch size of Black-throated Blue Warblers. Our estimates of Lepidoptera abundance were highly variable between years and were three times greater in some years compared to others. We fit hierarchical models and incorporated the variability in estimated Lepidoptera abundance using Monte Carlo techniques and found that variability in food not only positively influenced clutch size, but that the positive relationship was greater for renests than for first nesting attempts. We believe this demonstrates the important link between the timing of reproduction and food availability and indicates that food may become more limiting as the breeding season progresses in our system. (6577)

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INCIDENCE AND CONDITION CONSEQUENCES OF HABITAT CHOICE BY LATE-SUCCESSIONAL BIRDS IN THE POST-BREEDING SEASON

Declines in many forest songbirds have fueled opposition to even-aged forest management. However, recent work has found such birds in regenerating clearcuts in the post-breeding period, a critical time in avian life cycles. Whether such habitat shifts are commonplace, and positively affect physiological condition, remains unclear. I used constant-effort mist-netting in mature and young regenerating forests (cuts) in northwestern Pennsylvania from 2005 to 2008 to test whether (1) forest birds used early successional habitats disproportionately in the post-breeding season, and (2) such use affected physiological condition. Capture rates for most forest species ($n=1016$ new captures) were significantly higher in cuts (12.4/100 net-hrs) than forest interiors (5.3/100 net-hrs). Birds captured in cuts were more likely to have fat deposits, less likely to have ectoparasites, more advanced molt, and higher body condition scores than birds caught in forest interiors, suggesting habitat use has fitness consequences. I suggest that early successional habitats created by even-aged forest management may provide an

important resource for many late-successional forest birds, although there may be compensatory costs to such choices that I did not measure in this study. (6416)

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IS AN URBAN-POSITIVE SPECIES, THE NORTHERN MOCKINGBIRD,
MORE PRODUCTIVE IN URBAN HABITATS?

The Northern Mockingbird is a native species that is more abundant in urban than non-urban habitats (i.e., an urban-positive species). Abundance alone, however, is not an accurate index of habitat quality because urban areas could represent sinks or ecological traps for urban-positive species. We compared mockingbird nesting productivity, estimated survival, and decision rules governing site fidelity in urban and rural habitats. Because the mockingbird is an urban-positive species, we predicted that productivity of urban mockingbirds would exceed the estimated source-sink threshold and the productivity of non-urban mockingbirds. If urban areas act as ecological traps, productivity would be lower in urban habitats and would fall below the estimated source-sink threshold. Productivity of urban pairs exceeded that of non-urban pairs and more than offset estimated adult mortality. Apparent adult survival was higher in urban habitats than in non-urban habitats, although this could be driven by dispersal more than mortality. Decision rules appeared to differ between urban and non-urban populations. We conclude that urban areas are not ecological traps for mockingbirds and that increased breeding productivity contributes to their success in urban habitats. (6424)

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BLOOD PARASITE PREVALENCE AND BODY MASS INDEX OF SONG SPARROWS ACROSS AN URBANIZATION GRADIENT IN NE, PENNSYLVANIA

Species abundance and community composition change along urban-rural gradients. Avian health is also likely to vary along urban gradients as both disease vectors and resources vary with changing landscape composition. Using song sparrows (*Melospiza melodia*), we explored the relationships between body condition, haemosporidian parasite prevalence, and land use. We examined blood smears and body mass index from sparrows captured throughout the urban-rural gradient and used satellite imagery to obtain land use information from sites where birds were captured. We examined land use at three spatial extents around capture points: 90, 210, and 990 m. We used the Akaike Information Criterion to sort logistic and ordinary regression models for parasite prevalence and body mass index, respectively. Land use variables (including urban and forest cover) did not influence blood parasite prevalence. However, body mass was negatively influenced by urban cover. Our results suggest that urbanization negatively affects avian health but does not increase susceptibility to blood parasites. (6652)

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WHAT THE POST-FLEDGING PERIOD TELLS US THAT THE NESTING SEASON DOES NOT

Until recently, studies of breeding migratory songbirds have been primarily limited to the nesting season. Therefore, there is very little information about songbird survival and habitat use during the post-fledging period available to those making management decisions. We monitored nests and used radio telemetry to monitor survival and habitat use of fledgling Ovenbirds in managed northern hardwood-coniferous forests of northern Minnesota. In addition, we used mist-nets to sample use of early-successional forest stands (regenerating clearcuts) and forested wetlands by mature-forest-nesting birds during the post-fledging period. We found that many assumptions of songbird nesting studies were unreliable in our population, including the common assumption that the presence of a family group is confirmation of a successful nest in an occupied territory. In addition, we found that annual fledgling survival can vary considerably, and does not vary consistent-

ly with nest productivity; a finding with broad implications for models of songbird population growth. Furthermore, we found that habitat used by birds during the post-fledging period can be considerably different than that used for nesting, and that post-fledging habitat use can affect fledgling survival. In summary, nearly every conclusion that could be drawn from nesting data was contradicted by data from the post-fledging period in our study population. (6411)

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RAINFALL-INDUCED CHANGES IN FOOD AVAILABILITY MODIFY THE SPRING DEPARTURE PROGRAM OF A MIGRATORY BIRD

Climatic warming has intensified pressure for earlier reproduction in many organisms, but potential constraints imposed by climate change outside the breeding period have received little attention. Migratory birds provide an ideal model for exploring such constraints because they face warming temperatures on temperate breeding grounds and declining rainfall on many tropical non-breeding areas. Here, we use longitudinal data on spring departure dates of American redstarts (*Setophaga ruticilla*) to show that annual variation in tropical rainfall and food resources are associated with marked change in the timing of spring departure of the same individuals among years. This finding challenges the idea that photoperiod alone regulates the onset of migration, providing evidence that intensifying drought in the tropical winter could hinder adaptive responses to climatic warming in the temperate zone. (6449)

http://nationalzoo.si.edu/scbi/migratorybirds/science_article/default.cfm?id=71

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RECENT DIVERGENCE IN THE ORCHARD ORIOLE COMPLEX (ICTERUS SPURIUS): USING SONG TO UNDERSTAND SPECIES BOUNDARIES

Understanding species and the process of speciation is fundamental to understanding biodiversity. Studies of recently diverged species, and populations in the process of diverging, can investigate multiple aspects of species boundaries to understand the nature of species and speciation. A well-studied example of recent speciation in birds is the Orchard Oriole complex. The Orchard Oriole (*Icterus spurius*) breeds across most of the eastern US. Its closest living relative, Fuertes' Oriole (*Icterus fuertesi*) breeds in Veracruz, Mexico. Fuertes' Oriole was initially described as a separate species based on unique adult male plumage coloration and putative differences in vocalizations. However, later studies classified Fuertes' Oriole as a subspecies within *I. spurius*. Since then, much work has been done to classify these two taxa. We have found fixed differences in adult male plumage, migratory behaviors, and breeding habitat. However, no study has attempted to rigorously determine if there vocalization differences exist between the two taxa. To this end, we are comparing audiospectrographs of male songs from the two taxa to determine if there are aspects of these songs that are diagnostically different. (6507)

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VARIATION IN A DYNAMIC SIGNAL IS RELATED TO INITIAL TRAIT VALUE IN AMERICAN GOLDFINCHES

Orange bill color of American Goldfinches functions as a signal in mate choice and intrasexual competition, reliably signals immunological condition, and changes in response to stress and immune activation. We tested whether the degree of bill color change in response to stress varies with initial signal investment. We maintained 42 male and female American Goldfinches in captivity for one week and experimentally induced an immune response in half of these birds. We measured bill color twice daily. Bill color of all birds declined significantly over time, and the rate of decline was significantly greater in birds experiencing an immune challenge. Birds with more colorful bills at the beginning of the study lost significantly more color than birds that began with less colorful bills, but at the end of the experiment the initial high-color birds were still more colorful than the initial low-color birds. Birds that invest more heavily in bill coloration apparently

pay higher costs to maintain the signal, but appear able to sustain higher costs in the face of a challenge than low investment birds. (6497)

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THE INFLUENCE OF PHENOTYPIC TRAITS AND RELATEDNESS ON VARIATION IN DISPERSAL DISTANCE IN A NEOTROPICAL BIRD

Natal dispersal is the movement of individuals from their birth place to the site of first reproduction. Individual variation in dispersal may arise owing to intraspecific competition, sex, and heritability. Higher quality individuals are predicted to out-compete lower quality individuals for breeding sites closer to the natal site. Moreover, females often disperse further than males and siblings may have similar dispersal patterns. I studied individual variation in dispersal in the Western Slaty-Antshrike (*Thamnophilus atrinucha*) using radio-telemetry and re-sightings of birds. Individuals of higher quality (later age at dispersal, higher body mass, and earlier born) dispersed shorter distances. Sex-biased dispersal was not found and relatedness did not influence dispersal. Siblings from the same nest dispersed similar distances compared to unrelated individuals and full siblings from a different nest. Furthermore, opposite sex siblings from the same nest bred further apart than same sex siblings. This suggests inbreeding avoidance played a role in dispersal. Intraspecific competition influenced the phenotype of dispersers and common environment influenced dispersal distance. These results suggest that conditions experienced early in life have carry-over effects on dispersal. (6454)

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SCALE AND HABITAT USE BY BOREAL FOREST PASSERINES DURING THE POST FLEDGING PERIOD

We examined habitat use by two boreal forest warbler species during the post-fledging period. Our focus was assessing the spatial scale of habitat use and the relationship between scale of use and underlying behaviour. Immediately post-fledging, we have shown that juveniles move considerable distances prior to initiating migration, respond to habitat at different spatial scales and that these responses can vary with year. These results appear to differ from those at more southerly latitudes but we suggest that these differences are resolved if the landscape is considered as a combination of structural and productivity variables. Furthermore, in recent studies of juvenile songbirds during the initial stages of migration we and others have shown similar patterns of response to structural and productivity variables, scales of movement, temporal changes in habitat selection and the importance of decisions at multiple scales. We suggest that explicitly exploring the similarities and differences between the 'post-fledging' and 'migratory' periods will be a productive area of future research that will improve our understanding of the basic ecology and conservation needs of migrant songbirds. (6412)

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SPECIES TURNOVER AND RICHNESS LOSS FOLLOWING 100-YEARS OF CHANGE IN CALIFORNIA

Very few studies have investigated diversity changes from climate change using empirical data derived over long time spans, and no studies have done so while fully accounting for detectability over time. This study uses bird surveys collected 80-100 years apart in the Sierra Nevada of California to examine long-term changes in richness and species turnover. Occurrence data were analyzed using a hierarchical Bayesian occupancy model to account for species and survey-specific detectability of all recorded bird species. Findings illustrate how richness broadly declined over the 20th century across all elevations with turnover was greatest at the highest and the lowest elevations. The detection of both of these trends was strongly skewed by changing species detectability over time. Additionally, richness changes for species of each elevational life zone illustrates that diversity of high-elevation species is declining, without concurrent expansion into sites by mid-elevation species. Our results provide strong conservation implications for expected consequences of climate change on biodiversity. (6556)

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THE ROLE OF TESTOSTERONE IN SEASONAL INTERACTIONS: OBSERVATIONAL AND EXPERIMENTAL STUDIES IN THE AMERICAN REDSTART

Migratory birds face a conflicting set of energetic demands between preparing to migrate and preparing to breed. Physiological mechanisms that minimize conflicts, perhaps through diversifying hormone function, would be advantageous to both survival and breeding success. We sought to determine if variation in production of testosterone (T) could mediate winter to breeding carry-over effects in male migratory birds. In an observational study, we demonstrated that male American Redstarts (*Setophaga ruticilla*) increase T production before departure from Jamaica, and that males in better late winter condition have higher T. Further, we demonstrated that, compared to late arrivers, early arriving males at a breeding site in New Hampshire had higher T, were from higher quality winter habitat, were in superior migratory condition, and ultimately were more likely to successfully breed. In a hormone manipulation experiment, we showed that males with elevated T in late winter prepare to migrate faster (measured by change in mass, fat, and breast muscle) and depart on migration earlier. These results demonstrate that early elevation of T could facilitate early arrival at breeding areas, ultimately increasing fitness. (6540)

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DOES PLUMAGE REFLECTANCE SIGNAL DOMINANCE IN FLORIDA SCRUB-JAY JUVENILES?

Juveniles of the cooperatively breeding Florida Scrub-Jay (*Aphelocoma coerulescens*) exhibit sexually dimorphic, condition-dependent UV plumage. Although sexual dimorphism is typically explained by sexual selection, Florida Scrub-Jays usually do not breed before their second year, after the first and definitive pre-basic molts. We test the hypothesis that juvenile plumage signals dominance using behavioral observations and plumage manipulations. We observed 15 sibling dyads in 2008 and found that dominant individuals were more likely to have higher UV chroma. To confirm this finding experimentally we determined dominance of siblings in 22 groups, manipulated the plumage of the dominant individual in each, and repeated behavioral observations. We found that dominant individuals with experimentally reduced UV chroma suffered a significant decrease in the proportion of interactions won after manipulation. Dominant birds were more likely to be larger than their siblings as juveniles, but not as nestlings. We conclude that juvenile plumage does signal dominance and that social selection can drive the sexual dimorphism observed in this species. (6430)

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PERSISTENCE OF WOOD STORK COLONIES IN RELATION TO HABITAT ATTRIBUTES IN THE SOUTHEASTERN UNITED STATES

Wood Storks (*Mycteria americana*) are endangered species in the southeastern U.S. due to breeding population decline. However, information on conserving breeding habitat and keystone ecological processes are hampered by incomplete understanding of habitat attributes necessary for breeding. Our objective was to evaluate the relationship between Wood Storks colony persistence and habitat attributes using a 40-year record of colonies in the southeastern U.S. The principal assumption is that colony persistence is related to attributes and events within the colony and surrounding landscape. We examined habitat attributes in 147 colonies and measured factors within the colony (e.g., location, nesting tree availability, and disturbance) and surrounding landscape (e.g., land use changes within 12.5 and 25 km from colonies). Results showed that land use changes in grassland and forested wetland are negatively correlated with colony persistence. However, factors within the colony are also important in explaining colony persistence. Future study should incorporate hydrological characteristics to understand how Wood Storks respond to hydrological changes. (6603)

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ESTIMATING REGIONAL LANDBIRD POPULATIONS FROM ENHANCED BREEDING BIRD SURVEYS

Breeding Bird Surveys have been used for decades to monitor landbird populations in North America. Birds detected on these surveys during 3-minute counts at 50 locations provide an index to avian populations within the geographic region where they were collected. I sought to enhance the value of data collected during Breeding Bird Surveys by asking volunteers to record time (within 1-minute intervals) and categorical distance (50 m) within which each individual bird was first detected. Using data from >50 Breeding Bird Surveys in Mississippi during 2009 and 2010, I estimated probability of detection and radial distance of effective detection. From these statistics I estimated species densities and extrapolated to regional population estimates. To validate population estimates I estimated proportion of area occupied from these same data. I then compared the estimated area occupied by each pair to independent estimates of territory size gleaned from published literature. I compared and contrasted these population estimates with those identified within National Partners in Flight Planning process. (6566)

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HISTORICAL AND PROJECTED SHOREBIRD HABITAT IN SOUTHEASTERN MISSOURI

Shallow, seasonal floodwater on non-forest lands provides potential foraging habitat for migrating shorebirds (Charadriiformes). I estimated the daily availability of shorebird foraging habitat within southeastern Missouri from 1943 through 2009 under an assumption that shorebirds forage in 98%, to 60%. (6567)

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DOES AN EJECTED COWBIRD EGG INCREASE THE RISK OF NEST PREDATION IN GRAY CATBIRDS?

Many hosts may accept the cost of brood parasitism because the cost of ejection outweighs the cost of raising a parasite. We propose that parasitic eggs ejected and dropped near a host's nest attract predators and represent a previously unknown cost of ejection. We tested this hypothesis by comparing the frequency of predation at experimental Gray Catbird (*Dumetella carolinensis*) nests where a real, fresh Brown-headed Cowbird (*Molothrus ater*) egg was dropped below the nests to the frequency of predation at control nests where no manipulations occurred. Depredation frequency was not significantly different (Chi-square=0.64, $p=0.42$) at experimental nests (37%, $N=38$) compared to control nests (46%, $N=37$). Experimental nests where dropped cowbird eggs broke were depredated slightly more frequently (50%, $N=8$) than nests with intact cowbird eggs (33%, $N=30$), but this trend was not significant (Fisher's Exact Test, $p=0.32$). Although simulated grasp-ejected eggs did not attract predators to catbird nests, puncture-ejected eggs may be more likely to attract predators because the ejected eggs have been broken. (6388)

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A MULTILOCUS PHYLOGEOGRAPHY OF BLACK-HEADED GROSBEEK (*PHEUCTICUS MELANOCEPHALUS*)

We use 13 nuclear markers ($n=38$ each) and one mitochondrial gene (ND2, $n=424$) to analyze range-wide phylogeographic variation (42 localities) in the Black-headed Grosbeak (*Pheucticus melanocephalus*), a western North American montane woodland bird. Preliminary analyses revealed 3 reciprocally monophyletic clades: one found from Pacific Canada south to Baja California ('Pacific'), one in the interior United States south to central Mexico ('Interior') and one in southern Mexico ('Oaxaca'). Our analyses show extensive geographic areas of overlap among clades in eastern Washington, Oregon, and California as well as Michoacán. Uncorrected mitochondrial genetic distance (p) between clades ranged from 1.7% (Oaxaca-Interior) to 3.3% (Pacific-Oaxaca), compared to 5.8% between *P. melanocephalus* and its sister taxon, Rose-breasted Grosbeak (*P. ludovicianus*). Finally, we test for topological congruence between gene and species trees. (6634)

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DIFFERENCES IN STRUCTURE AND TEMPO OF LOW-AMPLITUDE SONG AFFECT MALE AGGRESSIVE RESPONSE IN DARK-EYED JUNCOS

Long-range song (LRS) is a high-amplitude acoustic signal produced by songbirds that typically functions in territoriality and mate attraction. Short-range song (SRS), in contrast, is an often more complex, low-amplitude signal that is produced by many species during close-proximity interactions associated with directed courtship or aggression. To investigate the relationship between structure and function of SRS, we measured the response of male Dark-eyed Juncos (*Junco hyemalis*) to simulated territorial intrusions of songs that varied in structure and tempo (low-amplitude or soft LRS, slow tempo SRS, and fast tempo SRS). Males responded significantly more strongly to fast SRS than soft LRS during the playback, whereas response to slow SRS was not detectably different from soft LRS. There was no significant difference in response between slow SRS and fast SRS. These results suggest that slow SRS and fast SRS may serve similar functions within courtship or aggression, yet are potentially different in function from soft LRS. Low-amplitude signals such as SRS and soft LRS have received little attention in the literature and should be considered in future studies of acoustic communication. (6404)

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HABITAT USE, HOME RANGE, AND SURVIVAL OF FEMALE FLORIDA MOTTLED DUCKS (*ANAS FULVIGULA FULVIGULA*) USING URBAN AND RURAL AREAS OF SOUTH FLORIDA

Florida mottled ducks (*Anas fulvigula fulvigula*) use urban and suburban areas where they are more likely to encounter, and hybridize with, feral mallards. Hybridization with mallards is considered the greatest threat to the Florida subspecies and may intensify as suburban areas expand inland. We used radio-telemetry data to examine habitat use and home ranges of females throughout the annual cycle and to determine the likelihood that urban females move to rural habitats and vice versa. We also compared survival of females using rural habitats to those using urban-suburban areas. Preliminary results show that the mean 95% isopleth home range size for rural ducks is 297,321 ha while the median is 112,755 ha. Home range size of urban ducks averages 2,547 ha and the median is 335 ha. Urban ducks mostly used low, medium, and high density residential areas and artificial impoundments and rarely moved to rural areas. As well, few ducks captured in rural areas were found to use urban habitats. According to the best model, annual survival of urban ducks (78.3%) was greater than that of rural ducks (42.5%). (6415)

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HOW DOES FIRE ENHANCE WADING BIRD FORAGING OPPORTUNITIES?

Prescribed fire is a common habitat management tool in uplands, but the effects on wetland dependent wildlife from burning wetlands are poorly understood. Preliminary studies in cattail-dominated marshes suggest that long-legged wading birds (order Ciconiiformes) are attracted to recently burned areas preferentially. This may be due to an increase in primary and secondary productivity following fire-induced release of nutrients and increase in light. In the oligotrophic Everglades, we experimentally manipulated light and nutrients and predicted that burned sawgrass (light plus nutrients) would result in higher primary productivity and standing stock of fish than other treatments. Significantly more periphyton cover was observed in light than shade treatments with the burned sawgrass treatment having the most periphyton cover. Significantly more fish were captured in light than shade treatments. More available nutrients and light apparently augment primary productivity and standing stock of small fish in the Everglades. The open habitat created by burning also probably enhances availability of the increased standing stock of fishes to wading birds. (6462)

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DEMOGRAPHIC & BEHAVIORAL CORRELATES OF MATURE-FOREST BIRD USE OF SUCCESSIONAL HABITAT DURING THE POST-FLEDGING PERIOD

A tacit conclusion of studies showing heavy use of successional habitats by mature-forest songbirds during the post-fledging period is that access to successional habitat promotes survival. We examined this survival, habitat use, and movement patterns of radio-tagged Ovenbirds (*Seiurus aurocapilla*; $n = 51$ fledglings and 85 independent juveniles) and Worm-eating Warblers (*Helmitheros vermivorum*; $n = 60$ fledglings) in Ohio, 2004-2007. Both species selected habitats characterized by dense understory vegetation, and use of these areas promoted survival. Most fledglings were not found in regenerating clearcuts and instead frequented areas of dense vegetation within mature forests, suggesting that large patches of successional habitat may not be required. In an experimental study of independent juvenile Ovenbirds, survival was similar for birds released into regenerating clearcuts and mature forests, though birds released into mature forest traveled farther from their release location compared to birds released into both clearcut treatments. While habitat structure influenced survival, nestling condition also was positively related to survival. Thus, post-fledging survival may be a function of both access to structurally complex habitat and carryover effects from nesting habitat quality. (6581)

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BIRD RESPONSE TO ENHANCED VEGETATION DIVERSITY IN THE SPRING RUN COMPLEX OF NORTHWESTERN IOWA.

Loss of habitat is one of the primary factors affecting population declines of grassland birds, and recovery efforts have focused on increasing the amount of grassland habitat in the landscape. The type of planting used in grassland restorations influences both the structure and species composition of the vegetation, and the availability of arthropod food resources for breeding birds. We compared grassland bird habitat use and arthropod availability among restored grasslands in the Spring Run Complex, Dickinson County, Iowa, USA in 2007, 2008, and 2009. We selected three grassland planting types, Cool Season, Warm Season (newly planted and mature), and High Diversity for our study to encompass the range of planting mixtures typically available to land managers. We sampled grassland bird densities using line transect surveys. The most common bird species we encountered were Bobolink, Common Yellowthroat, Red-winged Blackbird, and Sedge Wren. Bobolink densities were highest in Cool Season fields than in any of the other field types during all three years. Red-winged Blackbird densities did not differ among field types. Models of habitat use varied by species. (6519)

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MIDWESTERN BIRDS IN THE 21ST CENTURY: THE MORE THINGS CHANGE...

Major changes in bird abundance and distribution over the past century in the Midwest have included the decline of grassland and shrubland species, relative stability in forest birds, and adaptation to developed habitats by several species. Land use and climate change are likely to be major drivers of bird populations in the 21st century. Based on continuing trends and lands committed to non-agricultural use, we anticipate a substantial increase in the extent of developed areas, a modest increase in forest habitats, and a modest decline in area devoted to rowcropping. Concurrently, a significant demand for dedicated biomass energy crops is likely to emerge. Biomass energy crops will disproportionately displace Conservation Reserve Program grasslands, hay, pasture, and small grains rather than rowcrops. The major effects on bird populations of these changes are likely to be (1) northward range shifts of several species, (2) continued super-abundance of a few generalist species which thrive in developed or intensive agriculture systems, (3) downward pressure on grassland bird populations, and (4) a significant advantage to species that are able to utilize developed habitats. (6459)

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EFFECTS OF INCUBATION DELAY ON HATCHABILITY AND MICROBIAL GROWTH OF WOOD DUCK EGGS

Egg viability in birds declines with increasing length of incubation delay and may be influenced by microbial infection and exposure to temperatures $>24^{\circ}\text{C}$. Early onset of incubation may help to maintain egg viability. We manipulated exposure of Wood Duck (*Aix sponsa*) eggs and tested effects of incubation delay and ambient temperatures on egg viability and microbial growth. We examined incubation patterns of egg-laying females and compared natural incubation patterns to egg viability losses. Hatching success declined with increasing incubation delay but not with exposure to temperatures $>24^{\circ}\text{C}$. Odds of an egg hatching were reduced 11% for each additional day of incubation delay. Microbial infection of eggshells did not increase with increasing incubation delay or increasing ambient temperature. Egg-laying females began incubating at night about 7 d after nest initiation and 3 d before starting full incubation. Females began incubating at night earlier as clutch size declined. We suggest early onset of incubation is more important in reducing incubation period of precocial birds than in increasing viability of first-laid eggs. (6370)

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A STANDARDIZED METHOD FOR QUANTIFYING INDIVIDUAL AND SPECIES-SPECIFIC ONSET OF INCUBATION

The onset of incubation is often influenced by individual and environmental factors during clutch initiation and laying. In addition to intraspecific variation, inter-specific variation in incubation onset can create taxon-specific hatching patterns. Previously, individual and species-specific onset of incubation was determined using mixed models, maximum likelihood estimation, and empirical best linear unbiased predictors (eBLUPs) on nest temperatures recorded from the laying and incubation periods of 73 nesting attempts from 5 passerine species (Wang and Beissinger 2009). The hierarchical structure of mixed models allows simultaneous estimation of individual- and species-level parameters, as well as determination of intraspecific and interspecific components of variation in a multi-species dataset. Because eBLUPs are "sandwich" estimators that draw information from the entire dataset, the implications of varying sample sizes and variation in datasets are explored. This method is proposed as a standardized, quantitative way of determining the onset of incubation that is conceptually similar to traditional, qualitative assessments of incubation onset. (6523)

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TESTING HYPOTHESES ABOUT THE SISTER GROUP OF THE PASSERIFORMES USING AN INDEPENDENT 30 LOCUS DATASET

Advances in data collection have increased the feasibility of rigorously testing the controversial relationships using large independent datasets. Large-scale studies using morphological or molecular datasets have generated five different hypotheses about the sister group of Passeriformes. We used novel data from 30 nuclear introns from 28 taxa to test these five a priori hypotheses. The data primarily consisted of introns, which can lead to alignment ambiguities. By generating multiple alignments with different programs, parameters and guide trees (representing the a priori hypotheses), we recovered different tree topologies. However, the sister relationship between Passeriformes and Psittaciformes that corroborated one of the five a priori hypotheses was found most consistently and appeared most robust. Other incongruent phylogenies were largely influenced by Coliiformes, whose phylogenetic position was unstable. Thus, identification of "rogue taxa", like Coliiformes, remains critical even when large numbers of loci are used. After combining our data with that of Hackett et al., we received strong support for the sister group between Passeriformes and Psittaciformes, allowing the extensive studies on passeriformes to be placed in a more rigorous evolutionary framework. (6414)

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INVESTIGATING THE HABITAT SELECTION HYPOTHESIS WITH THREE DENDROICA WARBLER SPECIES

At the core of adaptive radiation is the variation of resource exploitation by closely related species. One explanation of such phenomenon is the "habitat selection hypothesis", which maintains that certain habitat characteristics induce constraints determining foraging opportunities and in turn influence community structure. *Dendroica* is a genus of warbler known for high diversity within overlapping territories. Three mixed forest *Dendroica* species (*Dendroica. coronata*, *D. caerulescens* and *D. virens*) were studied in order to test the group-based diversity in response to habitat variables such as complexity of vegetation structure (evenness of shrub, coniferous and deciduous coverage), canopy height and percentage canopy cover. There was significant association between *Dendroica* group diversity and vegetation structural complexity, as well as with canopy height. Specifically, group diversity associates with deciduous ratio. However no association was found between group diversity and canopy cover, shrub ratio and coniferous ratio. Connecting the knowledge about foraging strategies of the three species and their different responses to vegetation variables found in this study, habitat selection hypothesis was supported which facilitates the understanding of adaptive radiation. (6356)

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INVESTIGATING THE HABITAT SELECTION HYPOTHESIS WITH THREE DENDROICA WARBLER SPECIES

At the core of adaptive radiation is the variation of resource exploitation by closely related species. One explanation of such phenomenon is the "habitat selection hypothesis", which maintains that certain habitat characteristics induce constraints determining foraging opportunities and in turn influence community structure. *Dendroica* is a genus of warbler known for high diversity within overlapping territories. Three mixed forest *Dendroica* species (*Dendroica. coronata*, *D. caerulescens* and *D. virens*) were studied in order to test the group-based diversity in response to habitat variables such as complexity of vegetation structure (evenness of shrub, coniferous and deciduous coverage), canopy height and percentage canopy cover. There was significant association between *Dendroica* group diversity and vegetation structural complexity, as well as with canopy height. Specifically, group diversity associates with deciduous ratio. However no association was found between group diversity and canopy cover, shrub ratio and coniferous ratio. Connecting the knowledge about foraging strategies of the three species and their different responses to vegetation variables found in this study, habitat selection hypothesis was supported which facilitates the understanding of adaptive radiation. (6357)

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SHIFTS IN HABITAT USE FACILITATE RANGE EXPANSION OVER THE PAST 100 YEARS

The factors limiting a species' distribution are often uncertain. Interspecific competition, climate/energetics, supplemental feeding, and habitat availability can all influence the extent of a species' range. We used a data from a 100-year bird survey conducted in Illinois to investigate whether species exhibiting range shifts did so in association with changing habitat affinities. We used habitat-specific occupancy modeling to investigate how species' (N = 81) occupancy rates changed through time in developed, forest, grassland, wetland, shrubland, and agricultural habitats. Most species that expanded their range did so in association with greater occupancy of developed habitats. Conversely, the few species that have contracted their range have become much less common in developed habitats. For some species, adoption or differential use of certain habitats over time clearly merits consideration as an explanation for recent changes in their distribution. (6470)

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LONG-TERM VARIATION IN PATTERNS OF SEXUAL SELECTION IN A SOCIALLY MONOGAMOUS BIRD

The strength and pattern of sexual selection can potentially vary over time and space, yet the factors that might affect such variation are poorly understood. This is particularly true for socially monogamous birds, as in these species sexual selection operates through relatively cryptic processes, such as extra-pair paternity (EPP). Since 1995 we have studied the genetic mating system of a focal population of Black-throated Blue Warblers (*Dendroica caerulescens*), and have used a panel of microsatellite markers to determine the parentage of offspring produced in this focal breeding population. By characterizing mating patterns over this 16-year span (N > 800 broods), and also across multiple study plots in several years, we have obtained an exceptionally detailed picture of temporally and spatial patterns. Our results reveal that EPP contributed substantially to male reproductive success and generated strong opportunity for sexual selection, but also that the level of EPP, and hence the strength of sexual selection, varied substantially across years. We explore several factors that might contribute to this variation, including density, synchrony, and the influence of climate. (6641)

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MOLECULAR PHYLOGENETICS AND THE PATTERN AND TIMING OF DIVERSIFICATION OF TOUCANS (FAMILY: RAMPHASTIDAE)

Phylogenetic studies of Neotropical birds indicate that the timing and patterns of diversification are complex. Ultimately the comparison of patterns from multiple groups with different dispersal abilities has the potential to shed light on the mechanisms of diversification generally affecting Neotropical birds. The toucan family (Ramphastidae) has been a model for constructing generalized hypotheses of diversification patterns in the Neotropics. We reconstructed the phylogeny of nearly all toucan species and used a Bayesian relaxed-clock framework to calibrate this phylogeny to examine both the pattern and timing of diversification in this model group. Phylogenies constructed from these sequences were well resolved and well supported. Biogeographic reconstructions on the toucan phylogeny show two key patterns: (1) trans-Andean taxa have been derived five times from cis-Andean taxa and (2) highland taxa were derived five times from lowland taxa. Molecular clock calibrations suggest that 3/5 cis/trans-Andean splits are relatively recent and are probably consistent with dispersal (around the Andes) mediated speciation rather than montane vicariance speciation. (6645)

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ANCIENT DNA REVEALS RESILIENCE DESPITE THE THREAT OF EXTINCTION: THREE THOUSAND YEARS OF POPULATION GENETIC HISTORY IN THE ENDEMIC HAWAIIAN PETREL

Since the arrival of humans in the Hawaiian Islands, the endemic Hawaiian petrel has been extirpated from two islands and numbers on remaining islands have declined. We obtained mitochondrial DNA sequences from 417 birds, the oldest dating to 3,500 years ago, to investigate patterns of gene flow and temporal changes in the genetic diversity of this endangered species. Overall, differentiation was high among modern populations, however, it appears that birds from extir-

pated colonies on Oahu and Molokai may have dispersed to Lanai. No significant changes in genetic diversity have occurred despite previous fears that this species was extinct. Modeling demonstrates that the population decline was probably not as severe as previously thought, and simulations show that even a severe decline would result in the loss of minor levels of heterozygosity. Simulations also show that high levels of genetic diversity may be retained due to a long generation time. Therefore, a pattern of dispersal from declining colonies, in addition to long generation time, may have allowed the Hawaiian petrel to escape a genetic bottleneck after human colonization of the Hawaiian Islands. (6554)

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HYBRIDIZATION BETWEEN TERPSIPHONE VIRIDIS AND TERPSIPHONE RUFIVENTER

We are examining two species of Terpsiphone, *T. viridis* and *T. rufiventer*, which have been suggested to hybridize due to deforestation. We sequenced two mitochondrial loci and nine nuclear loci, and genotyped 12 microsatellite loci from multiple individuals of the two taxa above, along with four other Terpsiphone species. The mitochondrial data showed two clades: one primarily consisting of *T. viridis* (with one *T. rufiventer* individual) and a second clade that contained multiple individuals of both species. The two clades diverged approximately 1.5 million years ago, suggesting hybridization may be more likely than lineage sorting. The nuclear sequence data also suggests hybridization, as some individuals contain highly divergent alleles. Preliminary analyses of the nuclear data suggests that *T. viridis* and *T. rufiventer* are not sister species, further supporting hybridization over lineage sorting. Extensive hybridization was also suggested by the microsatellite data where most alleles were found in both species. Overall, our data suggest hybridization is occurring throughout the range of *T. rufiventer*, raising questions as to the future integrity of *T. rufiventer* as a species. (6654)

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STABLE ISOTOPIC EVIDENCE OF FORAGING SEGREGATION AMONG COLONIES OF A HIGHLY MOBILE SEABIRD, THE HAWAIIAN PETREL

The Hawaiian Petrel (*Pterodroma sandwichensis*) is an endangered seabird that feeds in pelagic regions of the NE Pacific Ocean and nests exclusively in the main Hawaiian Islands. We use stable carbon and nitrogen isotope values ($\delta^{13}\text{C}$ and $\delta^{15}\text{N}$) of flight feathers to study foraging segregation between four closely spaced Hawaiian Petrel breeding colonies. As demonstrated by results from hatch-year birds and adults, petrels nesting on different islands vary in their foraging locations during both the breeding and non-breeding seasons. Through isotopic analysis of modern and sub-fossil bone collagen, we further investigate the long-term persistence of foraging segregation. Ecological segregation, as observed in the Hawaiian Petrel, may reduce competition among breeding colonies and facilitate coexistence. Because a diversity of foraging strategies could offer stability in the face of future environmental change, preservation of colonies on different islands should be a goal of conservation management. (6578)

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NOVEL CLIMATES, NO-ANALOG COMMUNITIES, AND TRUNCATED NICHES

We live in a climate system that is changing rapidly and heading towards a state unlike any in the last tens of millions of years. An emerging challenge in global change ecology is to predict the responses of species and communities to these novel future environments. During the last deglaciation, species reshuffled into communities unlike any at present in response to climates with no modern analog. These no-analog communities and climates offer a model system for studying community assembly and disassembly in response to climate change. Many species fundamental niches are 'truncated' by the limits of current climates, challeng-

ing our ability to predict the effects of novel climates on community composition, ecosystem function, and biodiversity. (6624)

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THE FUNCTION OF BILL COLOR IN TEMPERATE AND TROPICAL NON-PASSERINES.

We explore the relationship of bill color and use of sunlight of 96 temperate and 39 tropical non-passerine species as a result of the selection to reduce glare from the bill. Wood-warblers with dark maxillae spend more time foraging in sunlight than those with pale maxillae. Willow Flycatchers (*Empidonax traillii*), which forage in the sun and have dark bills, shifted their foraging to shade when their bills were painted white. This supports the hypothesis that a dark bill reduces glare and refutes the alternative that melanin acts only as a UV-shield for birds foraging in sunlight. Our analysis of bill color among non-passerine species shows that sun-foragers with light maxillae are far more common among non-passerines than among passerines. This is especially true among gulls, ducks, grebes, and loons, which feed with the head underwater. Tropical non-passerines are more similar to tropical and temperate passerines than to the temperate non-passerines in pattern of bill color and use of light conditions. (6503)

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A TEST OF THE MIGRATION MODULATION HYPOTHESIS IN A NON-PASSERINE NEOTROPICAL MIGRANT, THE BLUE-WINGED TEAL.

Blue-winged Teal (*Anas discors*) initiate migration in late summer, with most making Trans-Gulf flights to overwinter in South America. As such, this species displays a fall migratory pattern unlike most waterfowl and similar to many Neotropical passerines. Corticosterone, the major avian hormone of stress and energy regulation, has been shown to influence the migratory physiology of passerines. The Migration-Modulation Hypothesis (MMH), a pattern of corticosterone secretion characterized by elevated baseline and a reduced adrenocortical response, has been documented in several passerine species during migration. However, little is known about the adrenocortical response in migratory waterfowl. Therefore, we sampled Blue-winged Teal during fall (N=8) and spring migration (N=5), and compared their adrenocortical profiles to those of breeding teal (N=11). Baseline corticosterone was low, did not differ among groups, and was not related to body condition. However, migrating teal showed a significantly reduced adrenocortical response when compared to breeding teal. While the low baseline corticosterone does not support the MMH, the reduced adrenocortical response during migration does, and suggests a mechanism to protect flight muscle from the catabolic effects of elevated corticosterone. (6445)

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PHYLOGENETIC DIVERSITY AND HOST SPECIFICITY OF AVIAN MALARIA ALONG A TROPICAL ELEVATIONAL GRADIENT

Bird species diversity on the eastern slopes of the tropical Andes decreases with elevation and shows evidence of low- and high-elevation plateaus and a peak in the subtropical 'foothill' zone. Species turnover along the gradient is high, reflecting narrow elevational distributions for most species and correspondingly high beta-diversity. The mechanisms causing maintenance of stable, narrow distributions are poorly known, but one hypothesis is that distributions are constrained by coevolved, host-specific parasites. We surveyed avian malaria along an elevational gradient from the lowland tropics to 4500m elevation. We used microscopy, PCR, and mtDNA sequencing to screen at least 150 birds in each of five elevational zones for malaria infection. Prevalence and phylogenetic diversity peaked at mid-

dle elevations for each of three malaria genera. Most malaria mtDNA haplotypes and clades are restricted to single elevational zones and single host taxa, suggesting strong coevolutionary dynamics along the elevational gradient, and high potential for parasite-mediated maintenance of montane bird diversity. (6474)

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EXAMINATION OF POPULATION STRUCTURE AND GENETIC DIVERSITY IN A RECENTLY DECLINING BREEDING POPULATION OF AMERICAN KESTRELS.

The American Kestrel (*Falco sparverius*) is North America's most numerous species of falcon. However, recent demographic data has begun to record a decrease in the number of individuals at both migration and nesting sites, especially in the eastern and northern sections of Canada and the United States. One important source of information that has not yet been utilized in the examination of the potential decline of the American Kestrel is genetic data. In this study we examined data from adults (N = 205) trapped at a breeding population in the boreal forest of Saskatchewan in 2007 and 2008. The nest box program in Saskatchewan has shown a significant decline in occupancy rates over the past twenty years. We used microsatellite data to look for a loss of genetic diversity in the population, a possible sign of a population bottleneck, and represent genetic evidence in support of the idea that the North American subspecies of American Kestrel is declining in numbers in the northern area of its range. (6520)

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EXAMINATION OF CLINAL PATTERNS OF BLACK AND WHITE TAIL COLORATION FOR MALE AMERICAN KESTRELS ACROSS THE NORTH AMERICAN CONTINENT.

Many species of raptor exhibit some form of plumage variation, yet little is understood about why so many species maintain such wide ranging color divergence. Explanations for the variation are often confounded by highly vagile lifestyles and wide ranges, which make it difficult to examine the entirety of the differentiation. The American Kestrel (*Falco sparverius*) exhibits high levels of both sexual dichromatism and variability in coloration, such as the 6th rectrices of the male, as well as a wide species range. In order to determine the degree and pattern of variation present in the tail coloration of kestrels in North America, data was combined from museum and wild birds (N = 611) from across the continent. Tail patterns were divided into six categories, and the frequency of each pattern was compared over different areas. We found evidence for a east to west cline in the frequency of both the pattern and level of variation, with kestrels in the east showing a larger amount of black and white coloration on their tails than seen with birds in the west. (6521)

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AN ISLAND RULE FOR AVIAN FLIGHT MUSCLES

Flightless island birds have highly reduced flight muscles. Does the reduction of flight muscles precede the loss of flight? I examined flight muscle size in volant birds on islands in the tropical Pacific and West Indies, using sternal keel length as a proxy for flight muscle size. Flight muscles are disproportionately smaller in birds on smaller, more remote islands with lower species diversity, a pattern that holds across taxonomic groups and archipelagos. I hypothesize that small flight muscles evolve in response to reduced interspecific competition, reduced predation, and corresponding relaxation of selection for flight power. Volant birds likely begin the evolutionary trajectory towards flightlessness soon after colonization of islands with reduced species diversity, even while flight remains integral to their ecology. (6593)

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REPRODUCTIVE SUCCESS AND HABITAT SELECTION OF PASSERINES IN BOTTOMLAND HARDWOOD FORESTS IN SOUTHEASTERN ARKANSAS

In 2010, we conducted point counts, and located and monitored nests in three forest blocks that will receive treatments designed to benefit avian species of concern. Study sites included Trusten Holder Wildlife Management Area (THWMA); Rattlesnake Ridge (RSR) and Scrubgrass Bayou (SGB), located in White River National Wildlife Refuge, Arkansas. Species richness for THWMA was 30; RSR and SGB, 28. Density estimates of the most common species for THWMA were 1.96 Northern Cardinals/ha; RSR, 0.95 Indigo Buntings/ha; and SGB, 0.88 Carolina Wrens/ha. We monitored 153 nests in these stands. The most frequently found species' nests were Indigo Buntings (N=76) and Northern Cardinals (N=56). Mean nest survival for Indigo Buntings and Northern Cardinals at THWMA was 8.2% and 6.1%; RSR, 10.9% and 7.7%; and SGB, 13.0% and 4.7%, respectively. Additionally, we sampled 416 vegetation plots at nests, random paired sites, and point count locations. Currently, these stands support few birds of conservation concern and nest success is extremely poor. Forest Management is warranted to enhance avian diversity and improve habitat for species of conservation concern. (6558)

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USE OF MAMMALIAN DUNG BY NESTING FAIRY PITTA (*PITTA NYMPHA*).

Nesting success affects the individual fitness directly in birds. Nests are the place where birds reproduce; the contents in nests are directly correlated to safety of nests and influence reproductive success of individuals. It's rare to see birds utilize animal dung in nests; however, the existences of mammalian dung were discovered in nests of Fairy Pitta (*Pitta nympha*, family Passeriformes). In order to understand the generality of this behavior, we visited Fairy Pitta nests from May to July in 2009 and 2010 at the Linnei township of Yunlin county in central Taiwan. Within 78 Fairy Pitta nests, including 84 nest periods, 74.4% of nests were observed with mammalian dung-like substance (MDS) placing behavior. We proposed anti-predation hypothesis and egg-incubation hypothesis, and we used artificial nests for hypothesis testing. Our results only supported anti-predation hypothesis, for the daily survival rates of nests have the dung of Formosan macaque were significantly higher than those without the dung (P

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DON'T PUT ALL YOUR EGGS IN ONE BASKET: NEST PREDATION RISK INCREASES EXTRA-PAIR PATERNITY IN THE JAPANESE GREAT TIT

Extra-pair paternity (EPP) in birds has been intensively studied in terms of individual characteristics, such as age, body size, sexual ornaments and clutch size. However, effects of external factors, such as environmental conditions and predation risks, on EPP are largely unknown because the control of such factors is difficult. We compared EPP of the Japanese great tit (*Parus minor*) in Hokkaido, Japan, between two nest-box study sites with different nest predation rates (87% vs. 0%). EPP rate was notably higher in the high predation site (15.7%, n = 30) than low predation site (7.3%, n = 25). We hypothesized that when there is a high possibility of losing all or large portions of offspring in one nest, males may try to mate with other females to reduce the risk of losing all offspring at a breeding attempt (i.e. bet-hedging strategy). The result suggests that external factors greatly affect the extra-pair behavior, and that male behavior may be an important force for the EPP in this population of the great tit. (6438)

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MICROHABITAT USE BY SONGBIRDS ON A CAPPED LANDFILL DURING THREE AUTUMN MIGRATION SEASONS

Little is known about the usage of capped landfills as stopover sites for migrating songbirds. Mist net surveys were conducted during three autumn migration sea-

sons at the Erie Landfill in Lyndhurst, New Jersey, which is located within the Atlantic Flyway. Specifically, bird activity was surveyed in three microhabitats, each characterized by a different dominant plant species: *Artemisia vulgaris*; *Populus deltoides*; *Robinia pseudoacacia*. The surveys yielded 2,058 captures of 70 bird species over 38 survey days during the Fall 2008 migration, 2,721 captures of 62 species over 35 survey days during the Fall 2009 migration, and 2,153 captures of 69 species over 37 survey days during the Fall 2010 migration. Activity of the most common species (e.g., *Passerculus sandwichensis*, *Melospiza melodia*, *Melospiza georgiana*, *Spinus tristis*) was highest in the *Artemisia vulgaris* patches – but microhabitat usage varied widely among different bird species and years. Overall, it appears that capped landfills may provide critical stopover sites for migrating songbirds. The complexity of trends suggests that significant microhabitat diversity will best serve restoration efforts that aim to improve bird habitat on capped landfills. (6483)

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FEAR KILLS: ANTI-PREDATOR BEHAVIOURAL RESPONSES REDUCE THE NUMBER OF OFFSPRING SONGBIRDS PRODUCE PER YEAR

Though theory suggests that predator-induced changes in prey behaviour may affect prey demography there have been almost no experimental studies on birds examining all of the steps in the pathway from predation risk to behavioural responses to changes in demography. We tested the effects of predation risk on parental anti-predator behaviours and demography in song sparrows. Predation risk was manipulated by broadcasting either predator- or non-threatening- calls and sounds, every few minutes, throughout the 130 day breeding season, over a 16 ha area. Predator playback females located their nests in denser, thornier vegetation; were more skittish; and spent shorter on- and longer times off- the nest during incubation; and predator playback parents made fewer feeding visits per hour during brood-rearing. Greater skittishness, and shorter on- and longer off- bouts during incubation, were associated with poorer hatching success; and nesting in denser, thornier vegetation, greater skittishness, and fewer feeding visits, were associated with poorer nestling survival. The cumulative cost of these effects on anti-predator behaviour was dramatic as predator playback parents fledged almost 40 % fewer offspring over the breeding season. (6353)

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PREDATION RISK INDEPENDENT OF DIRECT KILLING REDUCES THE NUMBER OF OFFSPRING SONGBIRDS PRODUCE PER YEAR

The impact of predators on avian populations has traditionally been ascribed solely to direct killing. Though theory suggests that the risk of predation may also affect avian population dynamics, it has not been previously experimentally demonstrated that predation risk alone can affect any of the three determinants of population growth: number of offspring produced per year, juvenile- or adult-survival. We tested the effect of predation risk alone on the number of offspring produced per year by female song sparrows. Direct predation was actively eliminated by protecting nests using electric fencing and seine netting, while predation risk was manipulated by broadcasting either predator- or non-threatening- calls and sounds, every few minutes, throughout the 130 day breeding season, over a 16 ha area. Females exposed to predator playbacks throughout the breeding season fledged a total of 3.8 ± 0.4 offspring (mean $\pm$ SE) whereas those exposed to non-threatening playbacks fledged 6.0 ± 0.4 ($P < 0.001$). Predator playback females produced fewer offspring because they laid fewer eggs, fewer of their eggs hatched, and more of their nestlings expired prior to fledging. (6354)

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ANALYSES OF NUCLEAR GENE SEQUENCES REAFFIRM THE LACK OF PHYLOGEOGRAPHIC STRUCTURE IN THE CALIFORNIA GNATCATCHER (*POLIOPTILA CALIFORNICA*).

The California Gnatcatcher ranges from southern California to the southernmost tip of the Baja peninsula, with populations in the U. S. being listed as threatened owing to habitat loss and fragmentation. Various subspecies schemes have been proposed based on clinal variation in plumage traits. A prior study of mitochondrial DNA (mtDNA) showed no geographic structure across the range, which supported neither proposed subspecies nor any other imaginable grouping. In addition, the mtDNA data suggested a northward colonization, based on the observation of lower of sequence diversity in the. Several authors have naively suggested that mtDNA sequence data are biased by lineage sorting and natural selection to the point that they cannot reveal phylogeographic pattern. We sequenced 7 nuclear introns and 1 exon for California Gnatcatchers from throughout the range. We found no evidence of geographic structure, and no differences in allelic diversity north and south of the Vizcaino Desert. We suggest that it is possible that evidence of a northward colonization, evident from an ecological niche model, is decayed faster in nuclear genes because of their larger effective population size. (6631)

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