

WILSON ORNITHOLOGICAL SOCIETY

AND

**ASSOCIATION OF FIELD
ORNITHOLOGISTS**

JOINT MEETING

Thursday, 21 April–Sunday, 24 April 2005
Beltsville, Maryland



ABSTRACTS

NOTES: Asterisk (*) in front of title is a paper in competition for one of the student awards to be given at this meeting. An asterisk following a name is the individual who will be presenting the paper in cases where there are multiple authors.

ORAL PRESENTATIONS

MARGARET MORSE NICE PLENARY PRESENTATION

1. TERRITORIALITY. . . BEYOND THE TEMPERATE ZONE. Eugene S. Morton and Bridget J. M. Stutchbury, Hemlock Hill Field Station, 22318 Teepleville Flats Rd, Cambridge Springs, PA 16403, and Department of Biology, York University, Toronto ON M3J 1P3.

Margaret Morse Nice pioneered the study of color-banded birds and territoriality through her studies of the Song Sparrow in the late 1930s. Avian territoriality ranks among the most popular areas of recent study in avian behavior but one might fairly ask, after such a long and rich history of research, whether there is anything important left to learn? Well, yes! Most studies of territoriality in birds have been conducted in the temperate zone where breeding seasons are very short. We explain why these models of territoriality do not apply equally well to tropical birds. There are types of tropical territoriality unknown in temperate latitudes. We highlight one of these, year-round territory defense, which allows territory acquisition and switching to occur year round. The removal of reproductive activities from territoriality, the norm in tropical birds, produces far-ranging differences. Males of many species have small testes and low levels of testosterone even in the breeding season! Extra-pair fertilizations, so rampant in temperate zone birds are much less common or even absent in many of the tropical passerines studied to date. We wonder what exciting discoveries Margaret Morse Nice would have described if she had had the opportunity to study tropical birds.

Other Oral Presentations

2. *LIMITATIONS OF ECOMORPHOLOGICAL ANALYSIS IN EXPLAINING HABITAT SPECIFICITY. Alex Mills, Dept. Zoology, University of Toronto, Toronto, ON M5S 3G5.

Ecomorphological studies frequently connect habitats and morphological traits. For most songbirds, both sexes occupy the same habitat, yet males and females are commonly dimorphic. If small morphological differences between similar species are attributable to differences in habitat, how is sexual dimorphism accommodated? I considered 27 skeletal measures of a guild of foliage-gleaning, insectivorous small birds in central Ontario, Canada, predicting that the closest pairs of morphotypes in morphological space would be conspecific opposite sexes, at least after correcting for size. I used (a) Principal Component Analysis (PCA), (b) difference matrices derived from PCA eigenvalues, and (c) Mantel tests. I found that conspecific opposite sexes were indeed morphologically correlated. However, in the breeding community (4 families, n=23 species), and various subsets of it, as well as in the autumn *Dendroica* wood-warbler community, nearest neighbours in morphological space were frequently non-conspecifics, especially when analyses were not corrected for absolute size. When the body is divided into three regions (head and skull; forebody and wing; hindbody and leg), males are significantly larger in each. For the anterior and posterior thirds, males exceed females by a modest 1%, whereas in the middle third, males exceed females by 4.5%.

Males are thus not simply a scaled-up version of females. Sexual selection appears to have moulded externally different male and female bodies, and yet conspecific opposite sexes occupy the same breeding habitats. Morphological differences between similar species to the extent manifested between conspecific opposite sexes is thus unlikely to be explained by adaptation to habitat differences.

3. *DOES MALE UV-BLUE COLOR INDICATE PARENTAL EFFORT IN MOUNTAIN BLUEBIRDS? Susan L. Balenger*, L. Scott Johnson, and Emilene Ostlind, Dept. of Biological Sciences, Towson University, Towson MD 21252.

Sexual selection theory predicts that exaggerated male ornamentation evolves in conjunction with a female preference for that trait if females benefit by mating with males exhibiting it. Benefits to females can include 'good genes' for offspring, a high quality territory, and/or increased parental effort. In socially monogamous species, males often provide substantial parental assistance to females. In such species, the quality of male plumage ornamentation may signal ability to provide parental care. Recent studies of Eastern Bluebirds (*Sialia sialis*) in Alabama suggest that males with brighter UV-blue colored plumage feed their nestlings more often than males that are less bright. We compared male coloration and parental effort in a montane Wyoming population of the congeneric Mountain Bluebird (*Sialia currucoides*). Nests were videotaped for 4-hour periods late in the nestling stage. We found no significant relationship between several measures of male color and male feeding rate or proportion of feeding trips made by males relative to females. We discuss possible reasons for why our results conflict with those obtained for Eastern Bluebirds.

4. SOCIAL ISOLATION LEADS TO A REDUCTION IN EP MATING:—IS THIS A HIDDEN COST OF FOREST FRAGMENTATION? Bonnie E. Woolfenden* and Bridget J.M. Stutchbury, Department of Biology, York University, Toronto, ON M3K 1P3, and Eugene S. Morton, Department of Zoological Research, National Zoological Park, Smithsonian Institution, Washington, DC 20008.

Over the past few decades a lot of research has focused on the ecological effects of forest fragmentation on the breeding productivity and population level trends of forest nesting passerines. It is clear that fragmentation can increase predation, levels of brood parasitism and even affect food availability all of which may negatively impact individual productivity. However, comparably little attention has been paid to the potential effects of forest fragmentation on the mating behaviour of forest birds. Here we compare the mating strategies of male Acadian Flycatchers breeding in populations that span a gradient of social landscapes to determine how differing degrees of social isolation affect social mating arrangements, extra-pair mating behaviours and reproductive success. We use genetic parentage analysis and radio-tracking to quantify the rates of extra-pair mating and the identity of extra-pair sires on 10 study sites of various sizes, degrees of woodlot isolation and densities of breeding pairs. Our results indicate that there are striking differences in the mating systems of populations breeding at high densities compared to those in smaller, socially isolated populations. In a large population (>30 pairs) most males are monogamously mated with only a few unmated (9%) and polygynous (3%) males. EP mating was common with 58% of nests containing EPY (extra-pair young) and 40% of nestlings being EPY. The EP sire was a neighbour in only 24% of nests with EPY and our results indicated that EP sires came from territories over 500-m away. In contrast, in the smaller populations (1–8 pairs) 24% of males are polygynously mated (2-3 females per male) while 12% of males remained unmated. Only 20% of nests contained EP young and 13% of young resulted from EP matings. As expected most EP sires were males residing in the same woodlot but a few came from surrounding woodlots. We discuss how the social environment can impact the costs and benefits of pursuing EP matings which will, in turn, influence the relative contributions of variance in EP mating success to overall male RS.

5. *LANDSCAPE-SCALE HABITAT USE BY LANDBIRDS DURING MIGRATORY STOPOVER NEAR AN ECOLOGICAL BARRIER AS REVEALED BY WEATHER RADAR AND GROUND SURVEYS. Jeffery J Buler*, Frank R. Moore, and Robert H Diehl, Department of Biological Sciences, The University of Southern Mississippi, Hattiesburg, MS 39406.

We evaluated the relative importance of several food abundance, habitat structure, and landscape variables in explaining densities of landbirds within hardwood forests along the Mississippi Gulf Coast during migration. We surveyed bird density every two to three days and arthropod abundance weekly among 24 transects during two fall and two spring migration seasons. Half of the transects were within large bottomland-hardwood forests (mean = 41,000 ha) of two major river systems, and half were located within small (mean = 73 ha) patches of hardwood forest along lower-order tributaries. Landscape variables, primarily the proportion of hardwood forest surrounding transects, were more important in explaining resident and migrant bird densities than habitat structure or food abundance. However, since the proportion of hardwood forest surrounding transects was significantly correlated to food resource abundance, it may serve as a proximate cue of food abundance for birds. Migrant density increased with proximity to the coastline (i.e. ecological barrier), unlike resident density, which highlights a constraint faced by migrants in selecting stopover sites. Analysis of weather radar observations encompassing half of the transect study area corroborated the importance of the amount of forested habitat and proximity to the coastline in explaining variation in bird densities, and enhanced the resolution of differences in how migrants use habitats in spring versus the fall. In fall, migrants are more evenly dispersed throughout the landscape, whereas in spring, migrants show stronger associations with forested habitats and areas in close proximity to the coastline.

6. *EFFECTS OF NEST CONTENTS AND MINIMUM DAILY TEMPERATURE ON FEMALE YELLOW-HEADED BLACKBIRD NEST ATTENTIVENESS. Jennifer L. Newbrey* and Wendy L. Reed, Department of Biological Sciences, North Dakota State University, Fargo, ND 58105.

We studied the effects of ambient air temperature and nest contents on the incubation attentiveness of female Yellow-headed Blackbirds (*Xanthocephalus xanthocephalus*) on seven wetlands on the Missouri Coteau in Stutsman County, North Dakota in 2004. A newly designed wire nest trap, which was highly successful in capturing females (83%), was placed directly over 77 Yellow-headed Blackbird nests and the entry time of each female was recorded. Female Yellow-headed Blackbirds incubating eggs entered the trap more quickly than females with nestlings. Unlike chicks, which are capable of heat-producing metabolism, developing embryos depend on incubating adults for warmth and prolonged cooling can lead to developmental abnormalities and reduced hatching success. Female entry time was also positively related to the number of eggs in a nest and minimum daily temperature. Yellow-headed Blackbird females with eggs, particularly ones with large clutches, may have entered the trap quickly to protect their costly reproductive attempts from being damaged by excessive cooling or from being destroyed by

Marsh Wrens (*Cistothorus palustris*). Our nest trap could also be used to study the effects of nest contents, clutch size, and minimum daily temperatures on female nest attentiveness in other species of wetland breeding icterids.

7. *ARE URBAN FORESTS ECOLOGICAL TRAPS FOR BIRDS? Lionel Leston* and Amanda D. Rodewald, School of Natural Resources, The Ohio State University, Columbus, OH 43202.

Few studies have examined processes (e.g. habitat selection, demographics) responsible for high densities of synanthropic native birds such as Northern Cardinals (*Cardinalis cardinalis*). Such studies are required to determine if urban forests actually benefit native birds. We identified cues used by cardinals to select habitat and evaluated how these cues are related to urbanizing landscapes and to the fitness of cardinals. Cardinals were surveyed within 2-ha areas at urban and rural riparian forest sites ($n = 12$) in central Ohio, 2003–2005, over 2 breeding seasons and the subsequent winters. We measured habitat cues (vegetation, nest microhabitat, winter temperatures, food) at nest and random plots, monitored fate and productivity of cardinal nests ($n = 288$), and recorded nestling-provisioning rates ($n = 120$). Cardinals were 500 % more abundant in winter and 167 % more abundant in breeding seasons in urban than rural forests, perhaps because cues used by cardinals increased with urbanization. Winter abundances were best explained by warmer temperatures (+ 2 degrees) in urban forests. Cardinals nested near edges with lower canopies and nearly 3 times greater densities of exotic shrubs, especially *Lonicera* spp. Urban forests may be ecological traps for native birds in that nests in exotic shrubs were 2.20 times likelier to fail, and such shrubs were 1.38 times denser in urban forests. However, we did not detect significant differences in daily nest mortality rates or seasonal productivity of cardinals between landscapes. Ongoing research from this study may be applied to managing urban riparian forests for native birds.

8. VOCAL DEVELOPMENT IN AMERICAN KESTREL (*Falco sparverius*) CHICKS: ACOUSTICAL CHARACTERISTICS AND ONTOGENETIC PATTERNS. John A. Smallwood* and Valerie Dudajek, Department of Biology and Molecular Biology, Montclair State University, Montclair, NJ 07043, Sivajini Gilchrist, Newark Museum, Newark, NJ 07101, and Mary Anne Smallwood, Ironia School, Randolph, NJ 07869.

We examined the acoustical characteristics of calls made by American Kestrel (*Falco sparverius*) chicks from a population breeding in nest boxes in northwestern New Jersey. We collected a total of 563 analog vocal samples from 88 chicks (49 males and 39 females) from 20 broods. We measured 13 frequency, 3 numerical, and 2 temporal variables using digital audio spectrography. The acoustical characteristics of calls changed in a consistent manner as chicks matured; calls became higher pitched and consisted of more notes delivered more rapidly. By day 16, chicks produced "klee" calls similar to those of adults. Discriminant function analysis failed to distinguish the calls of male and female chicks. However, univariate and principal components analyses suggest that vocal ontogeny proceeds more rapidly in males than in females.

9. PRELIMINARY RESULTS FROM ONGOING STUDIES OF NESTING HABITAT, NESTLING PROVISIONING, AND FORAGING OF THE SOUTHEASTERN AMERICAN KESTREL IN THE WEST GULF COASTAL PLAIN. Richard R. Schaefer*, D. Craig Rudolph, and Richard N. Conner, Southern Research Station, 506 Hayter Street, Nacogdoches, Texas 75965.

The Southeastern American Kestrel (*Falco sparverius paulus*) is a resident subspecies of the southeastern United States, reaching the western limit of its range in the West Gulf Coastal Plain Physiographic Region. This subspecies has been the focus of considerable research in the eastern portion of its range, but very little study has taken place in the western portion. We measured habitat characteristics around natural nest sites ($n = 12$). All nests were located in mature pine forest with very little midstory vegetation, but shrub density varied greatly. The ground cover at most sites contained abundant herbaceous vegetation and bare ground/leaf-litter, and sparse woody vegetation. Prescribed fire is the primary force shaping this habitat. Prey items delivered to nestlings ($n = 127$) consisted of lizards, especially green anoles (*Anolis carolinensis*), and various arthropods, especially grasshoppers. During the winter months, when the subspecies *sparverius* is also present, we gathered foraging data for both subspecies. Grasshoppers were the most common prey items identified for *F. s. sparverius*, while obtaining information for *F. s. paulus* has been problematic.

10. *DIFFERENCES BETWEEN VOCALIZATIONS OF WILD-REARED AND HUMAN-REARED BIRDS OF PREY AS AN INDICATION OF LEARNING WITHIN CALL DEVELOPMENT OF OWLS AND EAGLES. Karan J. Odom, Zoology Department, Ohio Wesleyan University, Delaware, OH 43015.

Few studies have tested whether nonpasserine species learn their vocalizations, although it is commonly accepted that they do not. This study explored the possibility that learning plays a role in song development in five raptor species: Barn Owls (*Tyto alba*), Barred Owls (*Strix varia*), Eastern Screech-Owls (*Otus asio*), Great Horned Owls (*Bubo virginianus*), and Bald Eagles (*Haliaeetus leucocephalus*). Based on the hypothesis that if birds of prey learn their calls, vocalizations of individuals lacking conspecific interaction at a critical period in development

will differ from the calls of individuals reared in the wild, I compared calls of human-reared individuals who lacked direct interaction with birds of their own species during early development to wild-reared individuals. All birds were recorded in central and southeast Florida. Total duration, number of notes, length of notes, length between notes, total amplitude and amplitude of separate notes for several calls of a single type of call for each individual were calculated by measuring sonographs and compared to each other to determine a typical call for each individual. Measurements of these six parameters of a single typical call for each human-reared individual of each species were compared to those of the wild-reared individuals.

11. USING MODELING TO IMPROVE MONITORING OF BIRDS: ARE WE COLLECTING THE RIGHT DATA? Todd Katzner*, Department of Conservation and Field Research, National Aviary, Allegheny Commons West, Pittsburgh, PA 15212, USA; E.J. Milner-Gulland, Imperial College London, Division of Biology, Manor House, Silwood Park Campus, Buckhurst Road, Ascot, Berkshire, SL5 7PY, UK; Evgeny A. Bragin, Science Department, Naurzum National Nature Reserve, Kustanay Oblast, Naurzumski Raijon, Dokuchaevka, 459730, KAZAKHSTAN.

Monitoring is central to most avian demographic studies and conservation efforts, but it may not always be directed at the most appropriate life stage. We use modeling to evaluate monitoring of a long-lived species, the eastern imperial eagle (*Aquila heliaca*), in Kazakhstan, asking whether the most appropriate information are being collected for understanding system state and dynamics. Static analysis suggests that current territory-based monitoring is a poor indicator of population size and growth and that monitoring survivorship would be more informative. However, currently monitored parameters have greater power to detect long-term changes in population size than do other alternatives. Threats to bird species can have immediate impacts on population size and growth or longer-term impacts on population dynamics. Prudently designed monitoring programs will detect the demographic effects of both types of threats.

12. WEST NILE VIRUS: PERNICIOUS EFFECTS ON AN AMERICAN CROW POPULATION. Carolee Caffrey*, Audubon Science, 545 Almshouse Rd, Ivyland PA 18974; and Shauna S.C. Smith and Tiffany J. Weston, Zoology Department, Oklahoma State University, Stillwater OK 74078.

In its spread west across North America in 2002, West Nile virus (WNV) reached a population of marked American Crows (*Corvus brachyrhynchos*) in Stillwater, Oklahoma, in late summer. Within two months, 46 of 120 individuals were missing or known to be dead, 39 of which (33% of the population) are estimated to have died for WNV-related reasons. In 2003, 56 of 78 marked crows disappeared or were found dead between June and November. Five of the 28 juvenile losses were possibly unrelated to WNV, thus we estimate that 65% of our population died because of this pathogen in 2003. We found only four of approximately 56 dead crows, which suggests that the tens of thousands of carcasses found in North America in the last five years may under-represent the number that have died by a factor of ten. The total loss of 72% of our population, including 82% of juveniles, in a single season of WNV exposure raises concern for precipitous declines in American Crow populations in coming years.

13. WEST NILE VIRUS IN EASTERN SCREECH OWLS: SUSCEPTIBILITY OF ADULTS AND TRANSMISSION OF MATERNAL ANTIBODIES TO YOUNG. Caldwell Hahn*, USGS, Patuxent Wildlife Research Center, 12100 Beech Forest Rd., Laurel, MD 20708-4019; Patricia Bright, American Bird Conservancy, PO Box 249, The Plains, Virginia 20198; Sharon Deem, Smithsonian Institution, National Zoological Park, 3001 Connecticut Ave. NW, Washington, D.C. 20008; Richard A. Bowen and Nicole Nemeth, Department of Microbiology, Immunology & Pathology, College of Veterinary Medicine & Biomedical Sciences, Colorado State University, Ft. Collins, CO 80523; Nicholas Komar, Center for Disease Control and Prevention, Arbovirus Diseases Branch, Fort Collins CO 80522.

We studied the susceptibility and transmission of West Nile Virus in screech owls (*Megascops asio*) in three ways: (1) investigating natural infection in captive screech owls housed in outdoor cages in MD, (2) tracking maternal transmission of WNV antibodies to hatchling owls, and (3) experimentally infecting juveniles under laboratory conditions. Three-quarters of the adult owls housed at PWRC showed WNV antibodies, but there was no pattern of infection related to age or cage location. Maternal transmission of WNV antibodies occurred in all broods of females that were WNV positive, and young owls within a brood showed different levels of antibodies. Screech owls were susceptible to experimental infection with live virus both by subcutaneous injection and oral ingestion, but not by vertical transmission from cage-mates. Individuals differed in degree of sickness, and some became severely ill and required euthanasia. [CANCELLED]

14. REFLECTIONS ON 40 YEARS OF BREEDING BIRD SURVEY. Chandler S. Robbins, USGS Patuxent Wildlife Research Center, Laurel, Maryland, USA 20708-4000.

After reviewing the history of monitoring in North America, I discuss the origin of the Breeding Bird Survey (BBS), including the need for such a program and field testing of methodology to determine optimum starting time, length of stop, number of stops per route, and acceptable weather conditions. Before initiating the survey I ran sample routes in Maryland, New Hampshire, South Dakota, Colorado, and Alaska to become familiar with environmental factors affecting roadside counts. I also ran the same route multiple times throughout a season to measure progressive changes in detectability, and did simultaneous double sampling to study observer effects. The BBS was field-tested with 50 routes throughout Maryland and ten in Delaware in 1965, then launched in the states and provinces east of the Mississippi River in 1966, and in the rest of the continent in 1967 and 1968. For quality control, all participants in 1965 were required, in addition to their assigned 50-stop route, to also run a 50-stop route that I had run the same year. In the first few years the results were keypunched into cards, and the cards were sorted various ways to prepare summaries. The electronics age has completely changed input and analysis procedures and ways of displaying results, but the field procedures are still the same as forty years ago. Thoughts on improving the BBS are shared.

15. THE BBS IN CANADA. C.M. Downes, Environment Canada, Canadian Wildlife Service, 1125 Colonel By Drive, Ottawa, Ontario, K1A 0H3.

In 1966, the BBS in Canada was started by Tony Erskine, Canadian Wildlife Service, in cooperation with Chan Robbins, USGS. Thirty-six routes were run in the Maritimes and Quebec. Currently, some 450 routes are run each year throughout all provinces and territories. The sampling goal in Canada is a minimum of one route per degree block. Sampling intensity is governed mainly by the availability of qualified observers and, especially in the north, reliable roads. Sampling intensity varies throughout the country with up to four routes per degree block in some areas especially where the population and road distribution is dense. The analytical method used by the Canadian Wildlife Service weights the number of routes per degree block in order to reduce the bias of uneven sampling. In 1996 a Grassland Bird Monitoring pilot project designed 31 routes using BBS protocol in areas with high concentrations of native grassland. These routes are not yet included in the main BBS database and discussions on whether or not they introduce a bias are ongoing.

16. PRACTICAL BBS SAMPLING CONSIDERATIONS WHEN USING VOLUNTEERS. Brent Ortego, Texas Parks and Wildlife Department, Victoria, TX 77905.

Although rigorously designed and recognized as needed by many ornithologists, the BBS lacked popular support within the wildlife management community during its early years. As decades passed, data were shown to be closely related to actual population trends for many species and the BBS was accepted as a very useful survey of breeding birds across landscapes. As we turned the corner on year 2000, the BBS was regularly used by Partners in Flight, conservation organizations, and public agencies for conservation planning. The national BBS office has assisted greatly with the use of BBS by providing greater data availability and a variety of analytical tools to interpret data, but at the same time the national office needs to strengthen its leadership role in implementing and refining the BBS. For example, a programmatic review of the BBS is needed to determine if adequate sample sizes are conducted—within strata, by species, or by habitat. Cost effective studies are needed to determine what magnitude of effort it will take to successfully monitor select species. Many state agencies are developing plans for all birds, they need information on adequate sample sizes, and whether it is warranted to increase samples via paid staff or increased volunteer efforts to obtain data needed. A survey was conducted this spring of state BBS coordinators asking questions on how well does the BBS, the survey as well as the infrastructure/coordination supporting the survey, meet each state's monitoring conservation needs. Results from the survey will be summarized and discussed.

17. THE NORTH AMERICAN BREEDING BIRD SURVEY: CREDIBLE, OR NOT? John R. Sauer*, William A. Link, James D. Nichols, and J. Andrew Royle, USGS Patuxent Wildlife Research Center, Laurel, MD 20708.

A schism exists in how the BBS is viewed within the conservation community. Some see the limitations of the survey as primarily logistical, while others reject the survey out of hand due to perceived limitations of the design. This schism must be resolved if the BBS is to be of use in the often contentious field of conservation biology. In this talk, I discuss a few of the issues associated with design and analysis of the BBS, and suggest some approaches to enhancing the credibility of the survey. One issue of particular relevance for discussion of the future of the survey is that of goals; modern survey uses require much more information than that provided by long-term trend estimates, and the presentation of survey results at temporal and spatial scales used in bird conservation places particular constraints on the survey. Field data indicate that detectability issues and roadside sampling invalidate the use of the BBS for population estimation and other goals relevant to conservation. Modifications to survey design can, and should, be implemented to enhance the value of the survey. Model-based approaches to survey analysis enhance the quality of the results by accommodating some features that likely bias survey estimates, permit better

integration with modeling for management of habitat features, and help identify lingering uncertainties with survey results that may require modification of the design of the survey.

18. OPTIMISING SAMPLING EFFORT ON REMOTE ROUTES. B.T. Collins, Environment Canada, Canadian Wildlife Service, 1125 Colonel By Drive, Ottawa, Ontario, K1A 0H3.

In remote areas there is often only a small roster of volunteers who can be assigned to BBS surveys but the target survey area may be extensive. In this situation there is need to design the survey to be as efficient as possible and there is an intuitive concern that a small number of sample sites may not adequately represent the target population. In this study, the potential to increase the surveyed area through running individual routes intermittently is examined through a simulation study. In the simulations, population change through either a change in density or a change in extent are examined to determine if the design would be suitable in both scenarios. However, designs with intermittent visits may be more susceptible to problems caused by missing observations or changing observers and this is also investigated.

19. SAMPLE SIZE GOALS FOR MONITORING NORTH AMERICAN NONGAME BIRDS. Jonathan Bart, USGS Forest and Rangeland Ecosystem Science Center, Snake River Field Station, 970 Lusk St., Boise, ID 83706.

Reliable estimates of trend in population size for birds are critical for effective wildlife management, but they require long-term commitments and substantial resources. It is thus important to establish quantitative targets for monitoring so that scarce resources can be allocated efficiently. Work on quantitative goals for long-term, large-scale surveys for nongame birds began several years ago when the landbird, shorebird, and waterbird initiatives established quantitative goals for monitoring abundance. A year ago, an analysis of Breeding Bird Survey routes was published which included the number of BBS routes needed - both with and without measures to reduce potential bias - to achieve the accuracy target for the majority of birds well-surveyed by the BBS. This analysis restricted consideration to the BBS even though many species are well-surveyed by other programs too. As a result, a new analysis is in progress that will include estimates of the accuracy of trend estimates from multiple sources of information and the predicted overall power that will result from combining the different trend estimates. This work will place the BBS estimates in context with other, well-designed surveys and will provide, for the first time, a comprehensive approach for monitoring the abundance of non-game bird populations in North America.

20. SPATIAL COVERAGE AND INFERENCE: TRADE-OFFS BETWEEN SURVEY DESIGN AND MODEL ASSUMPTIONS IN THE NORTH AMERICAN BREEDING BIRD SURVEY.

J.A. Royle* and J.R. Sauer, USGS Patuxent Wildlife Research Center, Laurel, MD 20708.

Route selection in the North American Breeding Bird Survey is based on a quasi-stratified random sampling design motivated (in part) by the desire to achieve unbiased estimates of trends and other summaries of avian population status. In practice, some departure from design intentions is realized because active routes become concentrated around urban areas, and this yields unbalanced sampling with respect to habitat and land use patterns, and temporal changes in land use. The need to consider potential biases induced by factors not controlled for (or uncontrollable) by design has motivated the development of a model-based framework for conducting inference about population status and trend assessments from BBS data. The present modeling framework is sufficiently generic to allow consideration of designs that deviate from random sampling. Thus, for example, redundant information that results from clustering routes around urban areas, or targeted sampling to assess specific hypotheses (e.g., about the effect of land-use patterns on population status), can be viewed not as deficiencies in the design, but as features that necessitate extension of existing models used for assessment. In this paper, we consider whether the sampling design is relevant to conducting inference about population status and trends, and we provide a framework for addressing potential biases induced by an imbalance in spatial coverage of sampled routes.

21. NORTH AMERICAN BIRD BANDING PROGRAM. Monica Tomosy, USGS, Patuxent Wildlife Research Center, Bird Banding Laboratory, Laurel, MD 20708.

The new Chief will cover the status of key elements of the Bird Banding Laboratory as well as review highlights over the past year. These will include: the upcoming Oracle-based database system, band supply, banding requests, band data requests, Band Manager, the Reward Band program, the 1-800-Mexico program, the partnership with Canada's Bird Banding Office, the strategic planning process, the budget, the Federal Advisory Committee, and a look to the future.

22. AVIAN VISION AND COLLISION AVOIDANCE. Robert C. Beason, Ohio Field Station, USDA, Wildlife Services, National Wildlife Research Center, 6100 Columbus Ave., Sandusky, OH 44870.

Birds are killed when they collide with structures such as buildings, communication towers, wind turbines, power lines, and aircraft. They would avoid such collisions if they could detect the object and recognized it as a

threat. Birds primarily depend on vision for sensory input and their visual systems are extensive and complex. To communicate with a bird we need to know how its visual system functions. The avian retina contains rod, single cone, and double cone photoreceptors. Rods are used for vision in dim light. Single cones appear to be tuned to cover specific segments of the spectrum from red to violet or ultraviolet. Double cones make up a large proportion of the retinal photoreceptors and might function in detecting movement. The retina contains several types of interneurons that are involved with the first stages of processing the visual information, including color and movement. Retinal ganglion cells send axons through the optic nerve to project in a highly ordered fashion to their primary visual targets. The avian optic nerve is completely crossed with the retinal ganglion cells of each eye projecting to the opposite tectum in a topographic manner. As the visual information is passed to subsequent locations in the brain, the receptive fields of the neurons become larger or functionally distinguished. These higher levels probably deal with orientation, and direction and velocity of movement as well as general features of the visual field including colors and shapes.

23. APPALACHIAN RIDGE FOLLOWING BY NIGHT MIGRATING BIRDS? A TEST OF THE HYPOTHESIS USING MARINE SURVEILLANCE RADAR IN THREE STATES. Paul Kerlinger, Curry & Kerlinger LLC, P.O. Box 453, Cape May Point, NJ 08212.

The hypothesis that night migrating birds fly at low altitudes, use updrafts, and follow ridges during fall over Appalachian ridges was tested at five sites, along four, high elevation (>820 m ASL; orientation ~ 215°) ridges using marine surveillance radar in horizontal and vertical modes. Migration traffic rate, flight direction and height of flight were collected by ABR, Inc. and Woodlot Alternatives, Inc. Mean migration rates were 174 and 187 targets per km of migration front per hour (t/km/hr) in Pennsylvania, 188 t/km/hr in Maryland, and 229 and 241 t/km/hr in West Virginia. These rates are lower than would be expected if birds were concentrated along ridge-tops. Orientation of migrants varied greatly and migrants, on average, crossed ridges at oblique angles. Mean flight directions were 219° and 188° in Pennsylvania, 193° in Maryland, and 175° and 184° in West Virginia. Mean altitudes of migration were between 410 and 583 m at the five sites and few migrants flew below 125 m (~7-13%), too high for them to be using updrafts from winds deflected by the ridges. These findings are not consistent with predictions of the hypothesis that night migrants follow ridges or use updrafts along these ridges during fall, but are consistent with broad front migration through Appalachia.

24. AVIAN COLLISIONS WITH COMMUNICATION TOWERS: A COMPARISON OF TOWER SUPPORT SYSTEMS AND TOWER HEIGHT CATEGORIES. Joelle L. Gehring*, Department of Biology, Central Michigan University, Mount Pleasant, MI 48859; Paul Kerlinger, Curry & Kerlinger, LLC, P.O. Box 453, Cape May Point, NJ 08212, Cape May Point, NJ; and Albert M. Manville, II, USFWS, Div. Migratory Bird Management, 4401 N. Fairfax Dr., Suite 632, Arlington, VA 22203.

The USFWS conservatively estimates that 4-5 million birds per year may collide with communication towers; however, some sources, including USFWS suggest the number could be higher. Despite documented large-scale fatalities of a diversity of bird species, little experimental research has been conducted to identify tower variables likely to increase the risk of collision. Data comparing the relationships between bird mortality, tower support systems, and tower height were collected simultaneously in Michigan during 20 days (per season) of the peak of songbird migration at 6 towers during fall of 2003, 23 towers in spring of 2004, and 24 towers in fall of 2004. Carcass removal rates and observer detection rates were measured at each tower. During the 3, 20-day sample periods a mean of 7.5 dead birds per tower per 20 days was found under guyed towers 116–146 m Above-Ground-Level (AGL), while a mean of 0.5 dead birds per tower per 20 days was found under unguyed towers 116–146 m AGL. Two 20-day sample periods detected a mean of 32.5 dead birds per tower per 20 days at towers >305 m AGL. Using non-parametric comparisons we found that towers supported by guy wires killed more birds than towers that were self-supported, while guyed towers >305 m AGL killed more birds than both guyed and unguyed towers 116–146 m AGL. This research constitutes the first controlled study from which managers can make scientifically validated recommendations for minimizing collision-related mortality of neotropical migratory and other birds by using unguyed, shorter (\leq 116–146 m) communication towers.

25. BROAD-FRONT MIGRATION + LOW CLOUD CEILING + HILLY TERRAIN = MIGRATION CHANNELING. William R. Evans, Old Bird, Inc. Ithaca, NY 14850.

The broad-front concept of nocturnal songbird migration in North America appears to have come together in the mid-20th century from Lowery's moon-watching studies. Radar observations strengthened the notion and today NEXRAD weather radar stations regularly reveal simultaneous migration over wide, 1000+-km, areas. Broad-front migration is not defined with respect to variation in migration density across the front. It simply implies that bird migration is occurring over a wide region with no discreet channels. However, in recent avian risk assessments for commercial wind energy facilities, the concept of broad-front migration is being stretched to suggest that the density

of migration across the front is fairly uniform. This idea is then put forth to support the idea that the risk of avian collision with wind energy facilities would also be uniform and, therefore, that the relative risk of specific wind farm locations is not worth studying. This may be true for regions with predominantly flat terrain. But in hilly or montane areas, there are conceptual grounds and some evidence that the flight density of nocturnal songbird migration can be greatly modified by variation in terrain altitude. This paper presents flight call data from a transect of acoustic monitoring stations in west-central New York that indicate complex channeling of nocturnal songbird migration in hilly terrain during low cloud ceiling conditions. Understanding the dynamics of this behavior could play an important role in siting tall man-made structures in hilly or montane terrain for reducing collision risk to night-migrating songbirds.

26. *IS SHORTER BETTER? DOES TRUNCATION INCREASE THE UTILITY OF OPEN POPULATION MODELS IN STOPOVER ESTIMATION? Jennifer M. Urbanski*, Department of Biology, Jerry Dudziak, Bioinformatics Program, Sara R. Morris, Department of Biology, and H. David Sheets, Department of Physics, Canisius College, Buffalo, NY 14208.

Avian stopover length estimation may be difficult if capture histories have few captures and recaptures overall or if there are limited captures during a portion of the season. Truncating a capture history at the beginning and/or end may alleviate these problems without introducing bias into the stopover estimate. Therefore, our overall goal of this study was to determine the effects of truncation on stopover estimation. Using banding data from Appledore Island, ME, and Braddock Bay, NY, that was initially unable to be modeled were truncated and checked for estimability ($n = 26$). Additionally, 24 capture histories that were originally able to be modeled were truncated and analyzed using the same models to determine if truncation altered estimated stopover length, minimum stopover length, and standard error for each. Truncation allowed modeling of 46% of the originally inestimable capture histories. Additionally among histories that could be modeled initially, truncation resulted in limited stopover length distortion, but resulted in larger standard errors among most capture histories. Furthermore, minimum stopover and its standard error changed very little among these capture histories. Thus, truncation appears to be of limited use in increasing the utility of open population models.

27. *COMPARISON OF SPECIES DISTRIBUTION AND HABITAT USE DURING STOPOVER ON TWO ISLANDS IN THE GULF OF MAINE. Rebecca Suomala* and Kimberly Babbitt, Natural Resources Department, University of New Hampshire, Durham, NH 03824, and Sara Morris, Department of Biology, Canisius College, Buffalo, NY, 14208.

Migrant songbirds were mist netted on Star Island, NH (13.4 ha) and Appledore Island (33.6 ha), ME, two islands in the Isles of Shoals Archipelago, during spring and fall migration in 1999 and 2000 to compare species differences in relation to habitat during stopover. Differences in distribution between the islands were species-specific and highly consistent among sampling periods for nearly all species. Stopover habitat use was related to habitat structure, vegetation species, diet (degree of frugivory), and habitat area, but the predominant factor(s) differed among species. Habitat use was most closely associated with breeding habitat. Species that nested in scrub-shrub and open habitat or were highly frugivorous in fall were more numerous on Star Island, which had shorter and denser vegetation than Appledore Island, and had few to no trees. Of the 11 species that were more common on Appledore Island, ten were forest-breeding species, nine of which are area-sensitive on the breeding grounds. Among forest-breeding species, island use was more closely correlated with area-sensitivity than either migration distance or edge sensitivity. Data suggest that the protection of large, unfragmented stopover sites containing a variety of habitats, including fruit-bearing shrubs, is an important part of conservation planning.

28. *BEHAVIOR OF THERMAL SOARING MIGRANTS IN VERACRUZ, MEXICO. Ernesto Ruelas Inzunza*, University of Missouri, 105 Tucker Hall, Columbia, Missouri 65211; Stephen W. Hoffman, Predator Conservation Alliance, Bozeman, Montana 59771; and Laurie J. Goodrich, Hawk Mountain Sanctuary Association, Kempton, Pennsylvania 17961.

Thermal soaring is a mode of assisted locomotion for cross-country flights preferred by many large, diurnal migrants. The mechanics of this process were described thirty years ago along with supporting theoretical models. Birds locate unevenly distributed atmospheric convection and turn tight circles around uprising thermals. After climbing the maximum height possible, migrants exit the thermal and glide in their desired flight direction in a gradual sink. Once migrants have lost height, they locate a new thermal and start the process again. In this paper we address two aspects of the flocking behavior of wading birds, vultures, and raptors during their spring and fall migrations through Veracruz, Mexico. Our results describe the flocking behavior of 15 species of birds with different morphological traits and its relationship with environmental variables. Specifically, we examine (1) the differences in thermal climbing turning radii and ability to climb thermals, and (2) the flapping effort in cross-country flights. We contrast our field observations with existing models in order to test the validity of their

predictions to environmental conditions in the tropics. Although our observations generally agree with model predictions, we suggest some changes to adequately weigh the influence of morphology and environmental variables in the choice of flight strategies for thermal soaring.

29. ISLAND CONSERVATION OF MEXICAN INSULAR AVIFAUNAS. Juan E. Martínez Gómez, Department of Biology, University of Missouri Saint Louis and Island Endemics Foundation.

Although significant progress has been made in policy making and conservation of natural preserves in mainland Mexico, island conservation has not been addressed properly. It is necessary to use objective criteria when defining mid-term and long-term conservation priorities. Thus, the number of extant endemics and native forms, the level of habitat degradation, and the amount of effort, both economic and social, required to preserve what currently survives and to revert degradation processes on Mexican Island would indicate that Mexican authorities and non government organizations should set their conservation priorities as follows: 1) Isla Socorro, 2) Isla Cozumel, 3) Isla Guadalupe. A task force to protect critically endangered bird species is required to put in action effective management schemes to protect the Cozumel Thrasher, the Townsend's Shearwater, the Socorro Mockingbird, the Socorro Parakeet, and the Guadalupe Junco. Mexican authorities should also support those conservation efforts that will become catalysts for broader conservation schemes such as the reintroduction program of the Socorro Dove.

30. HABITATS AND HORMONES: UNDERSTANDING THE PHYSIOLOGICAL BASIS OF LIFE HISTORY STAGES IN MIGRATORY BIRDS. Rebecca L. Holberton* and Jason C. Johnston, Lab of Avian Endocrinology, Dept. of Biol. Sci., University of Maine, Orono, ME 04469, and Peter P. Marra, Smithsonian Environmental Research Center, Edgewater, MD 21037.

The significance of migratory connectivity has been demonstrated in several species of Neotropical migrants. Events during the non-breeding period are strongly linked with subsequent breeding success and annual survivorship. While habitat type can affect the way in which birds undergo transitions from one life history stage to the next, the physiological mechanisms underlying stage- and habitat-dependent energy regulation are poorly understood. We will present results from several studies illustrating stage- and habitat-related physiological measures of energetic condition, with particular emphasis on indicators of the energetic trajectory (e.g., metabolites of fat storage and retrieval) that individuals may be on at the time of capture. This approach may provide important "real time" information about habitat suitability as birds undergo the transitions between different stages of the annual cycle.

31. DO WIND TURBINES INFLUENCE THE DENSITY OF BREEDING SONGBIRDS? Timothy O'Connell* and Martin Piorkowski, Department of Zoology, Oklahoma State University, Stillwater, OK 74078.

Few studies have examined the potential indirect effects of wind development on breeding birds, although anecdotal evidence suggests that some species, especially prairie birds, avoid any tall structures in their habitat. In 2004, we coordinated with FPL Energy to develop a field research project at the Oklahoma Wind Energy Center (OWEC) in Harper and Woodward counties, OK. Our objective is to investigate the potential indirect effects of wind energy development on breeding birds of the mixed grass prairie of northwestern Oklahoma. We compared breeding songbird density (using a probability of detection estimator) of sites in similar habitats at varying distances to wind turbines: directly along the turbine strings (adjacent), at intermediate distances (~ 1km), and at more distant locations (5B10km). We determined that three primary habitat types are represented among the existing wind turbine strings: native prairie, cropland (primarily in wheat production), and a mixture of riparian Eastern redcedar (*Juniperus virginiana*) woodland and pasture. Because gravel or sand access roads connect the wind turbines, all 26 transects included a Aroad@ component as well. We conducted 206 point counts in 2004, and detected 49 breeding species at the OWEC. Results from the first field season show variable response to wind turbines. For example, Lark Sparrow, Red-winged Blackbird, and Western Meadowlark densities were highest far from the turbines; Eastern Meadowlark densities were highest on adjacent transects. We will continue field work in 2005 to determine which species may be avoiding, unaffected, or attracted to wind turbines at the OWEC.

32–34. [not given]

35. THE BIOGEOGRAPHY AND PALEOECOLOGY OF KOA-FINCHES, EXTINCT LEGUME-EATERS OF THE HAWAIIAN ISLANDS. Helen James, Bird Division, MRC-116, National Museum of Natural History, Smithsonian Institution, Washington, DC, 20013-0712.

Koa-finches are extinct members of the Hawaiian finch or honeycreeper radiation of the genus *Rhodacanthis*. Two species of koa-finches survived long enough to overlap with 19th century ornithological collectors, who discovered them in 1891 but were unable to collect any further specimens after 1896. Both species were restricted to mesic forest on the island of Hawaii, where they fed on the leguminous pods of the native koa tree (*Acacia koa*). Quaternary fossils of koa-finches reveal two additional extinct species and extend the distribution of the genus to Maui, Oahu, and Kauai. The fossils provide evidence of 0.3 to 0.4 million years of morphological stasis in the koa-finches on Oahu, in contrast with biogeographic evidence for double colonization and speciation, accompanied by morphological divergence, over the past 0.5 million years on the island of Hawaii. Rapid speciation and divergence on the youthful island of Hawaii may be related to the processes of sweepstakes dispersal and community assembly on new landscapes. Osteological features of koa-finch crania suggest that all members of the genus were resource specialists adapted to feeding by slicing open leguminous pods. The universal extinction of koa-finch populations apparently occurred during a time when koa trees remained relatively widespread and abundant in mesic forest. Causes of extinction may have included increased predation by alien mammals, mortality from alien diseases, and the loss of drier lowland forest that may have been important, at least seasonally, to koa-finch populations.

36. ELABORATE FEMALE COLORATION IN TROPICAL ORIOLES (*ICTERUS*): PHYLOGENETIC AND BEHAVIORAL STUDIES. Kevin E. Omland, Biology, UMBC Univ. Maryland, Baltimore, MD 21250.

Studying the causes of sexual dimorphism has been a major focus of ornithologists for decades. However, much of this research program implicitly assumes that dimorphic species have evolved from a cryptic monomorphic ancestor, and thus focus on male ornaments. We are testing this assumption and focusing on females for our studies of dichromatism in New World Orioles (*Icterus*). Most tropical oriole species are monochromatic bright, whereas most temperate species are dichromatic. Males of all species have strong patterns involving a combination of black, white and/or color. Females differ dramatically with most temperate females being cryptic olive yellow without strong patterns, whereas most tropical females have strong patterns and are often indistinguishable from males. Character mapping on the molecular phylogeny suggests that the ancestral state is monochromatic bright with patterned females. We are initiating phylogenetically paired behavioral comparisons between tropical and temperate breeding species. We are focusing on the role of females in parental care and territory defense, as well as on whether temperate species may have serial monogamy whereas tropical species may have lifetime monogamy. Thus we are attempting to understand dimorphism in orioles by understanding why females have repeatedly lost bright coloration.

37. *PIGMENT CO-DEPOSITION AND THE MASKING OF CAROTENOIDS IN ORCHARD AND FUERTES'S ORIOLES. Christopher M. Hofmann*, Thomas W. Cronin, and Kevin E. Omland, Department of Biological Sciences, University of Maryland Baltimore County, Baltimore, MD 21250, and Kevin J. McGraw, School of Life Sciences, Arizona State University, Tempe, AZ 85287.

Carotenoids play a key role in producing the brilliant colors of many birds. However, an increasing number of biochemical studies have found instances in which melanins also produce bright coloration. Although carotenoids and melanins may confer similar colors (e.g., orange and yellow), they are produced in different ways and are believed to serve different signaling functions. In this study we examined what appeared to be 'switches' from carotenoid- to melanin-based color in two sexually dichromatic New World orioles with delayed plumage maturation. We sought to determine whether carotenoids were lost or masked in Orchard and Fuertes's Orioles and also to elucidate how female and yearling male color was produced. We found that chestnut adult male Orchard Oriole plumage color is produced predominantly by phaeomelanins. Further biochemical analysis revealed that carotenoids were still present, indicating that masking had occurred. Both carotenoids and phaeomelanins appear to contribute to color in adult male Fuertes's Orioles. In contrast, yellow yearling male and female plumage colors are produced by carotenoids. Our findings are interesting in light of the signaling roles carotenoids and melanins are believed to play and suggest that the current dichotomous framework in hypotheses of color signaling may be overly simplified.

38. *USING NEW WORLD ORIOLES TO ADDRESS AN OLD QUESTION: EVOLUTION OF MIGRATION. Beatrice Kondo* and Kevin E. Omland, Department of Biological Sciences, University of Maryland–Baltimore County, Baltimore, MD 21250.

Numerous theoretical articles have explored the possible origin of seasonal migration in birds. Many of the seminal works on the origins of migration suggested environmental or social situations that might have led to the

evolution of migration. Those highly speculative approaches have been supplemented recently by attempts to determine the causes of changes to migratory behavior occurring in modern species and their immediate ancestors. We used a novel method, “multi-state” analysis of migration, to examine patterns of migratory gain and loss in the New World Orioles. This analysis examines migratory changes using a phylogenetic tree that indicates how recently taxa diverged as a function of mitochondrial DNA divergence. We found multiple instances of gain of migration from a non-migratory ancestor, in a pattern that indicates migration may be gained rapidly and in an ordered fashion. There were multiple instances of increases from short-distance migration to long-distance migration in closely related taxa. Furthermore, we found that every migratory species had a different migratory behavior from its closest relatives, indicating that migration may preclude speciation, so that speciation among migratory taxa only occurs when migratory behaviors differ. Surprisingly, partially migratory species were not closely related to fully migratory species. We have discovered several novel patterns involving gain of migration, and we suggest using this technique to examine changes of migratory behavior in other groups of closely related birds.

39. *MOLECULAR PHYLOGENY OF CAPRIMULGIDAE (NIGHTJARS AND NIGHTHAWKS). Kin-Lan Han*, BEES Program, Department of Biology, University of Maryland, College Park, MD 20740 and Michael J. Braun, Department of Vertebrate Zoology, National Museum of Natural History, Smithsonian Institution, 4210 Silver Hill Rd., Suitland, MD 20746.

Caprimulgidae is a cosmopolitan family of nocturnal insectivorous birds traditionally divided into two subfamilies, nightjars (Caprimulginae) and nighthawks (Cordeilinae). We wished to test the monophyly of the subfamilies as well as the monophyly of two genera, *Caprimulgus* (57 species) and *Eurostopodus* (7 species), within the nightjar subfamily. A molecular phylogeny of the Caprimulgidae was reconstructed using cytochrome *b* and *c-myc* DNA sequences to address these questions. The data support biogeographical groupings, including two major New World clades and one Old World clade. The two New World clades include one comprising the whip-poor-wills, Chuck-will's-widow, and poorwills, and a second clade comprising a diverse group of Neotropical taxa. The subfamilies are not monophyletic, suggesting that aerial foraging, and other characteristics of nighthawks, arose multiple times through convergent adaptation. The cosmopolitan genus *Caprimulgus* is polyphyletic with respect to many other general within the family, which are often defined by distinct plumage traits that may reflect sexual selection. *Eurostopodus* species form the earliest branches of the tree and the genus may be paraphyletic. All early branching taxa have a distribution around the Indian Ocean, suggesting that region as a possible origin of Caprimulgidae.

40. DIFFERENT GENETIC MARKERS REVEAL DIFFERENT LEVELS OF INTROGRESSION IN A *MANACUS* HYBRID ZONE. Tamaki Yuri* and Michael J. Braun, Department of Vertebrate Zoology, National Museum of Natural History, Smithsonian Institution, 4210 Silver Hill Rd, Suitland, MD 20746; Robert W. Jernigan, Department of Mathematics and Statistics, American University, Washington, DC 20016; Robb T. Brumfield, Museum of Natural Science, Louisiana State University, Baton Rouge, LA 70803; and Nirmal K. Bhagabati, The Institute for Genomic Research, Rockville, MD 20850.

Hybrid zones are often characterized by narrow, coincident clines for diverse traits, suggesting little introgression occurring across them. However, the perception of limited introgression may result from a bias in hybrid zone studies to focus on genetic and morphological traits that are most differentiated among parental populations. Such traits may experience purifying selection in hybrid zones and, when analyzed alone, underestimate introgression. We tested this hypothesis in a *Manacus* hybrid zone by comparing cline structure in two sets of molecular markers: isozyme and RFLP markers chosen for differentiation between parental forms, and microsatellite markers chosen for polymorphism in one parental form. We predicted that, on average, the microsatellite clines would be broader in width and more variable in position because they experience less purifying selection than the set of isozyme and RFLP markers. Both likelihood and smoothing spline analyses showed that cline centers for microsatellite alleles were more variable than isozyme and RFLP markers, and several were shifted by as much as 40-100 km from the diagnostic cline centers. Three microsatellite cline centers were significantly displaced from all diagnostic cline centers by both likelihood and bootstrap comparisons. Cline widths for microsatellite alleles were also variable, and the likelihood estimates averaged eightfold wider than those of the four diagnostic markers. Five microsatellite clines were significantly broader than any of the diagnostic clines. This pattern is consistent with the prediction that markers chosen for differentiation between parental forms, and particularly diagnostic markers, will underestimate the amount of introgression across hybrid zones.

41. EXTRA-PAIR PATERNITY AND MATE CHOICE IN A CHICKADEE HYBRID ZONE. Matthew W. Reudink and Robert L. Curry*, Department of Biology, Villanova University, Villanova, PA 19085.

The dynamics of hybrid zones are likely to be influenced greatly by patterns of mate choice, including “cryptic” choice mediated through extra-pair copulations. Therefore, to understand changes in hybrid zones over time and space, detailed examination of mating patterns and correlates are needed. We studied the role of extra-pair fertilizations (EPFs) in the breeding biology of hybridizing Black-capped and Carolina chickadees in southeastern Pennsylvania over more than 4 years, using microsatellite DNA markers. We detected extra-pair offspring in 56% of 90 nests examined; these accounted for at least 26% of 477 offspring. Unlike hybridizing *Ficedula* flycatchers, chickadees do not appear to use EPFs to reduce costs of heterospecific pairing: EPFs were no more likely to occur in genetically dissimilar (heterospecific) social pairs than in pairs where social mates were genetically similar. However, females paired with Black-capped-like males were more likely to have extra-pair offspring. Females that acquired EPFs did not obtain these from males genetically similar to themselves; instead, all females, regardless of their genotype or that of their social mate, tended to prefer Carolina-like males as extra-pair partners. There was no relationship between the presence of extra-pair offspring and hatching or fledging success. High rates of extra-pair paternity and apparent female preference for Carolina-like males suggest that mate choice is an important influence in the ongoing northward movement of this hybrid zone.

42. O.W.L. UPDATE. Jay M. Sheppard*, 3359 Cranberry So., Laurel, MD 20724 (jmsheppar@aol.com); Kenneth P. Able, 535-000 Little Valley Rd., McArthur, CA; and Robin McCleery, Edward Grey Institute for Field Ornithology, South Parks Rd., Oxford OX1 3PS, UK.

Ornithological Worldwide Literature (OWL) is an indexed bibliography of citations that pertain to ornithology and come from the periodic, worldwide scientific literature. In the 21st Century, published scientific information that cannot be found at a later date is information lost to that science. OWL is a project run by volunteer abstractors and editors around the globe. This effort now provides a free, online searchable database (www.birdlit.org/owl) with over 57,000 indexed citations and is expected to have more than 90,000 records by the end of the year. The sources, capabilities and important features of this bibliographic service are discussed and illustrated.

43. FAT PROPORTION OF MIGRATING AND STAGING EARED GREBES DOES NOT DIFFER. H.I. Ellis*, Department of Biology and Center for Comparative Physiology, University of San Diego, San Diego, CA 92110, and J.R. Jehl, Jr., Division of Birds, Smithsonian Institution, Washington, DC 20560.

As part of a larger study on basal metabolic rate and body composition in Eared Grebes (*Podiceps nigricollis*), we looked at the relationship between fat mass (g) and body mass (g). We had three sets of migratory grebes associated with Great Salt Lake (GSL), Utah and one set of staging grebes from Mono Lake (ML), California. The GSL birds represented a migration south from the lake in late fall or early winter; a migration north to the lake in spring; and a migration south to the lake in late summer. These birds showed enlarged pectoral muscles and atrophied digestive organs typical of migratory grebes (Jehl 1997). The ML birds were from their fall staging and had atrophied pectoral muscles but hypertrophied digestive organs. They were also gaining weight, as opposed to the migratory grebes. An ANCOVA test determined no differences among the migratory groups, so those data were pooled. In spite of substantial body component differences and the fact that migrating birds were losing fat while staging grebes were accumulating it, the relationships between fat and body mass were identical for the two groups, although at any particular mass, there was about 35 g more fat in migrating grebes than staging grebes.

44. A PRELIMINARY EXAMINATION OF THE USE OF HYDROGEN ISOTOPE RATIOS IN ESTIMATING THE NATAL LATITUDES OF HATCH YEAR RUBY-THROATED HUMMINGBIRDS. Cathie A. Hutcheson*, 1 Rowan Road, Makanda IL 62958, Leonard I. Wassenaar, Stable Hydrology and Ecology Laboratory, National Water Research Institute, Environment Canada, 11 Innovation Blvd., Saskatoon, SK Canada, S7N 3H5, and Lewellyn Hendrix, Sociology Dept., Southern Illinois University, Carbondale, IL 62901-4524.

This study seeks to determine whether stable-hydrogen isotope ratios can be used to estimate natal latitudes of RTHUs as a way of examining migration patterns. Sample 1: R4 feathers from the first 10 HY RTHUs of the 2003 season were collected by nine banders from across the RTHU range within the USA. The stable-hydrogen isotope ratios for these feathers were determined, and these were regressed on latitude of collection site. A simple linear model explained 74% of the variation in isotope ratios, but an added quadratic expression boosted variation explained to 84%. Thus isotope ratios from HY RTHUs do vary in a curvilinear by latitude way. Isotope ratios do not discriminate clearly among all southerly sites, but there is a break in isotope between 39 degrees and 40 degrees latitude. Sample 2: R4 feathers from every 20th HY RTHU banded in 2002 were collected in Southern Illinois (SI) (N=34). Converting these 34 cases to t-scores based on the sample of the 10 first HY RTHUs for SI suggests that 4 migrated from more northern latitudes, 1 came north from southern latitudes, and 29 likely are from SI or nearby latitudes.

45. UNEVEN ENERGY SAVINGS IN CANADA GEESE DURING FORMATION FLIGHT: DO BIRDS EXPLOIT THEIR POSITION WITHIN THE FLOCK? Kirk M. Goolsby, Department of Math, Science & Engineering, Northern Virginia Community College, Annandale, VA 22003.

The air pattern created by a goose's wing in flight is predictable in shape. Wingtip vortices are the horizontal columns of spiraling air formed behind each wing. During formation flight, geese arrange themselves within these vortices to reduce energy usage. Several empirical studies support this assertion (Hummel 1995; O'Malley & Evans 1982; Weimerskirch et al. 2001). Apparently, these energy savings are not evenly distributed to each position within a formation (Badgerow & Hainsworth 1981; Cutts and Speakman 1994; Hainsworth 1987; Hummel 1983, 1995; Lissamen and Schollenberger 1970; O'Malley and Evans 1982; Weimerskirch et al. 2001). Position shifting occurs frequently within formations and could help distribute energy savings to all within the formation (Hummel 1983; Kieffer 1993; pers. observ.). The results of this study suggest that energy savings are not evenly distributed to individuals despite the frequent position shifts observed. A captive-reared flock of 32 Canada geese (*Branta canadensis*) trained to fly with an ultralight aircraft was observed during formation flights. From this flock, six geese had a significant proclivity for flying in the most energy efficient positions. I was unable to determine why these 6 acted in this way. No correlation was identified between them and several physical and behavioral traits examined. An explanation for why these geese exhibited this behavior is unclear. There may be some variable that affects flight behavior that was not examined. For now, perhaps, the most important finding is that certain geese appear to maximize energy savings better than others during formation flight.

46. *A CRASH COURSE IN COMMUNICATIONS TOWER MORTALITY: BIRDS DYING TO BECOME A STATISTIC IN WESTERN NEW YORK. Colleen E. Bell* and Sara R. Morris, Department of Biology, Canisius College, Buffalo, NY 14208, and Arthur R. Clark, Buffalo Museum of Science, Buffalo, NY 14211.

Concern about the effects of communication towers on migrating birds has been renewed due to the increase in the number of towers as the communications industry has expanded. We present here the kill characteristics based on 30 years of study of avian mortality at the WKBW television tower in southern Erie County, New York, from 1970 through 1999. During fall migration, the tower was visited on over 320 days, and the number of birds salvaged on those days varied widely, ranging from 1 to 1,089 birds. While the majority of the kill events were small, involving 10 or fewer birds, the majority of birds died in larger kill events. Both the proportion of kill events and the proportion of individuals killed were highest in September. Across the 3 decades of this study a number of differences in kill characteristics were noted. The exact peaks of kill events and proportion of individuals killed varied among decades. Additionally, the size of kill events varied across the 3 decades, most notably there were no very large kill events (> 500 birds) during the 1990s, which could explain the previously observed decline in birds salvaged at this tower.

47. THE USE OF URBAN RIPARIAN FORESTS BY MIGRATORY LANDBIRDS. David A. Aborn, Department of Biological and Environmental Sciences, University of Tennessee at Chattanooga, Chattanooga, TN 37403-2598.

Stopover areas are important for landbird migrants because they allow the birds to regain mass that might have been lost during passage. Selecting the most suitable habitat for resolving these *en route* contingencies can facilitate a prompt resumption of migration, whereas improper selection may result in delayed arrival on the breeding or wintering quarters. One set of habitats that have been found to be important for migrants are those associated with riparian zones. Such habitats, however, have also suffered extensive loss and degradation. Migrants are finding themselves in an increasingly urbanized environment. In order to ensure the persistence of migratory landbird populations it is important to understand the degree to which these species use urban riparian areas and how well the suitability of these habitats compare with more pristine riparian areas in terms of the birds' mass changes, foraging rates, and stopover length. I have been observing and mist netting migrants in an urban riparian park in Chattanooga, TN and in a nearby state natural area to make such comparisons. Preliminary results suggest that these habitats are used as stopover sites, and that migrants do equally well in the urban forest as they do in the natural area, although species composition differs between the two.

48. PLASMA LIPID METABOLITES AND REFUELING PERFORMANCE AT FOUR STOPOVERS ALONG THE MIGRATORY ROUTE OF SEMIPALMATED SANDPIPERS. James E. Lyons* and Jaime A. Collazo, USGS Patuxent Wildlife Research Center and North Carolina Cooperative Research Unit, North Carolina State University, Raleigh, NC.

Assessing stopover habitat quality and refueling performance of individual birds are crucial to the conservation and management of migratory shorebirds. Plasma lipids indicate the trajectory of mass change in individuals and may be a more accurate measure of refueling performance at a particular site than static measures

such as nutrient reserves. We measured plasma lipid metabolites of Semipalmated Sandpipers at four coastal stopover sites during northward migration: Merritt Island, FL; Georgetown, SC; Pea Island, NC, and Delaware Bay. We evaluated the effects of body mass, age, and date on plasma lipid concentrations and described variation in metabolic profiles among the four stopovers. Plasma triglyceride concentration, an indicator of fat deposition, declined during the migration, whereas B-OH-Butyrate, a measure of fasting, increased. Triglyceride concentration was not related to body mass or age, but was correlated with phospholipids and inversely related to B-OH-butyrate. Triglyceride levels and estimated percent fat were greater at Delaware Bay than at any stopovers to the south. Plasma metabolite profiles accurately reflected stopover refueling performance and provide an important new technique for assessing stopover habitat quality for migratory shorebirds.

49. ESTIMATING THE GLOBAL ABUNDANCE OF MCKAY'S BUNTINGS ON ST. MATTHEW ISLAND, ALASKA. Steven M. Matsuoka* and Jim A. Johnson, U.S. Fish and Wildlife Service, Migratory Bird Management, Anchorage, AK 99503, and Daniel R. Ruthrauff, Teresa L. Tibbitts, and Robert E. Gill Jr., U.S. Geological Survey, Alaska Science Center, Anchorage, AK 99503.

We estimated for the first time the global abundance of McKay's Buntings (*Plectrophenax hyperboreus*) from surveys conducted in 2003 across their restricted breeding range on St. Matthew and Hall islands, Alaska. We used a multi-model approach to both estimate population size from counts with distances estimation and measure the relative effects of environmental variables on abundance and its subcomponents. We counted 2,400 individuals along over 200 km of transects during our surveys. Probability of detecting birds on surveys varied strongly both with habitat and observer experience conducting line-transect surveys. The number of birds encountered per km of transects increased relative to slope, presumably because birds were selecting steep slopes with abundant rock crevices for nesting. When adjusting counts for detectability and slope we estimated 32,300 birds (CV 6.9%) in the global population. This was 5-16 times the number of birds previously suspected to comprise the species.

50. NESTLING BEGGING AND THE PROBLEM OF SIGNAL RELIABILITY. Douglas Mock* & P.L. Schwagmeyer, Department of Zoology, University of Oklahoma, Norman, OK 73019.

Nestling birds gape and vocalize when their parents bring food, but the nature of the information communicated is unclear. The predominant explanation is that begging behavior provides parents with accurate information about each offspring's condition, thereby enabling efficient adjustments to parental effort (total food delivered) and/or allocation (division among nestmates). This "honest begging" model is predicated on 3 key assumptions: (i) that begging signals are costly; (ii) that parents respond positively to stronger signals; and (iii) that individual signal strength is negatively related to the offspring's true condition. Despite not making much sense, this third point has been repeatedly "documented" with experiments showing that hungry (food-deprived) nestlings escalate their begging. We suggest that this empirical support is ill conceived. Hunger is a proximate indicator of what a nestling *wants* and, as such, may or may not reflect true condition ('need'), specifically its potential for enhancing parental fitness. New data from a field manipulation of chick condition indicate that parents -- fathers in particular! -- bring more food to broods with *lower* needs. This result accords with the possibility that nestling signals are more likely to communicate high offspring merit, and not weakness. If so, then begging may indeed provide reliable indices of offspring quality.

51. NEOPHOBIA IN MALLARDS AND OTHER WILD DUCKS. Russell Greenberg*, Gregory Gough, and Daniel Boritt, Smithsonian Migratory Bird Center, National Zoological Park, Washington, DC 20008.

Response to novelty shapes the way birds colonize new habitats and approach unfamiliar foods. Most adult birds show some degree of neophobia, but the intensity of the fear response varies both within and between species. In 1983, Greenberg proposed the Neophobia Threshold Hypothesis (NTH), which holds that species that display a high degree of ecological plasticity do so, in part, because they are less neophobic. We tested this hypothesis on three species of duck (Mallards, Wood Ducks, and American Black Ducks) by presenting food with and without novel objects to a wild population at the National Zoological Park. We presented 10 novel objects with alternating (30 min) control trials. We predicted that the Mallard, which shows the greatest ecological distribution of any North Temperate freshwater duck, would show reduced levels of neophobia compared to the other species. Although the sample sizes for American Black Ducks are equivocal, the Mallard was disproportionately late to feed and showed a more reduced visitation rate at novel objects compared to the other species. The average time to feed during controls was less than 3 min, whereas feeding at novel objects often took up to 4, 30 min sessions to occur. These results are consistent with studies of captive-reared Mallard and American Black Ducks. Studies of other organisms show that species living in association with humans (adaptable to anthropogenic change) may also be highly neophobic. In part contradicting the NTH, neophobia may characterize species commensal with humans that suffer from intense human predation.

52. A GRAPHICAL ANALYSIS OF THE COSTS OF FEMALE COPULATORY ACTIVITY IN BIRDS. Harry W. Power*, Department of Ecology, Evolution and Natural Resources, Rutgers University, New Brunswick, NJ 08901, and Michael P. Lombardo, Department of Biology, Grand Valley State University, Allendale, MI 49401.

At least 3 goals have been hypothesized to account for the copulatory activity of female birds: *fertilization*, and the benefits of *sperm competition* and acquiring *beneficial sexually transmitted microbes* (bSTMs). That birds pursue the first is incontrovertible, that they pursue the second is supported by some direct and much indirect evidence, and that they pursue the third is supported only indirectly. Achieving each of these goals from fertilization to acquiring bSTMs requires progressively greater amounts of copulatory activity in terms of both numbers of copulations and numbers of partners in order to be fully realized. Therefore female copulatory activity should be an indicator of the goal(s) sought, and a way to determine which if any of the 3 hypotheses is correct in application to particular birds. We present a graphical model that enables us to understand the cost and benefit combinations required to achieve each goal. The principal results of analysis using the model are that (i) the gross benefits of the successive goals must rise exponentially for costly copulatory activity to be favored, and (ii) high rates of copulatory activity are most favored when costs are already high and rising quickly. The first result is expected since costs rise exponentially, but the second is initially counterintuitive. We discuss the biological reality of our results in terms of their underlying biological assumptions, and suggest ways to test whether natural selection works in the ways required to support our conclusions.

53. GENE MORTON'S CONTRIBUTIONS TO MIGRATORY BIRD ECOLOGY. John H. Rappole, Smithsonian Conservation and Research Center, 1500 Remount Road, Front Royal, VA 22630.

Gene Morton began his research career at a time when ecological thinking was dominated by the ideas of Robert MacArthur and his students. Migratory birds fit neatly into one of these concepts, namely that of "fugitive species," a term developed by MacArthur and E. O. Wilson to refer to species "...able to survive by the relatively quick and temporary occupancy of a suitable new habitat as these first become available; in contrast, other species specialize in more persistent tenancy of relatively stable habitats." Classifying migrants in this way allowed ecologists to ignore them in studies of tropical communities, since migrants obviously were just filling the interstices created by environmental disturbance, and were not real members of the communities. Gene took a different approach, actually studying migrants without a pre-conceived notion of their "place." In papers in *The Auk*, *Atlantic Naturalist*, and *American Naturalist*, he presented detailed observations of both migrant and resident bird species living in the tropical communities on Barro Colorado Island in the Panama Canal Zone, and speculated on what these observations might mean in terms of their evolutionary history. The effects of these papers, in combination with his extraordinary efforts to seek out and encourage students of similar mindset, have had a profound positive influence on a generation of migratory bird ecologists.

54. THE SIGNAL DESIGN OF PAIR DUETS: DOES STRUCTURE RELATE TO FUNCTION? Timothy F. Wright* and Christine R. Dahlin, Department of Biology, New Mexico State University, Las Cruces, NM 88003.

Gene Morton has influenced thought in many areas of ornithology and animal behavior, including the evolutionary design of signals and the importance of duetting in tropical birds. We build upon this foundation to discuss the potential relationship between the acoustic structure of pair duets and their communication function(s). We first describe the structure of duets in a Neotropical parrot, the yellow-naped amazon (*Amazona auropalliata*). Duets in this species are composed of contact calls and three duet-specific note types that are combined to make an acoustically-complex compound signal with substantial variation from rendition to rendition. Three primary syntactical rules are evident in these duets. First, the duet-specific note types are also sex-specific, with one type performed by females and the other two types by males. Second, sex-specific notes are delivered antiphonally and in pairs, with the male note following and often overlapping that of the female. Third, note types appear in a strict sequential order in which each note could be repeated a variable number of times or omitted entirely, a pattern previously termed combinatorial syntax. Each of the syntactical rules found in the yellow-naped amazon can be related to specific hypotheses for the signal design of duets. We conclude with a survey of the limited literature on syntax and other structural features in the duets of other species. This survey provides some preliminary support for general design rules for the structure of pair duets but also highlights the need for further work describing duet structure.

55. FORAGING AND TERRITORIAL ECONOMICS OF SEXUALLY-DIMORPHIC PURPLE-THROATED CARIBS, *Eulampis jugularis*, AT THREE HELICONIAS. Ethan J. Temeles*, Robin S. Goldman, and Alexei U. Kudla, Department of Biology, Amherst College, Amherst, MA 01002.

We observed territorial Purple-throated Caribs (*Eulampis jugularis*) at three heliconias on the island of St. Lucia, West Indies, to examine how calculated costs and benefits compared to observed patterns of *Heliconia* use. Across the three years of our study, *H. caribaea* territories defended by males were significantly smaller in area and

had higher densities of flowers than red-green *H. bihai* territories, and both kinds of male *Heliconia* territories were smaller and had higher densities of flowers than the green *H. bihai* territory maintained by a female. During the period birds maintained territories, total costs were more than met by energy obtained from territories. The smaller territory areas and higher flower densities of *H. caribaea* territories lowered males' foraging time and energy costs per flower relative to red-green *H. bihai* territories, theoretically allowing them to meet their energy demands in less time and at lower cost. Males' estimated foraging time and energy costs were greatest at the green morph of *H. bihai*; compared with females, they would save a higher proportion of time and energy by foraging at *H. caribaea* and the red-green morph of *H. bihai*. This asymmetry in relative gains from foraging at each of the three heliconias for males and females may further reinforce resource partitioning between them, in addition to differences in size and fighting abilities.

56. POPLAR ISLAND RESTORATION IN CHESAPEAKE BAY: FROM MORTON'S WRENS TO TERN MECCA. R. Michael Erwin, USGS Patuxent Wildlife Research Center, Department of Environmental Sciences, University of Virginia, Charlottesville, VA 22904.

The island complex of Poplar-Jefferson-Coaches islands has had a long history that including brief ownership by the Smithsonian Institution. In the 1800s, the island was more than 1100 acres of mostly mixed pine-hardwoods, shrubs, and salt marsh with a few freshwater ponds. By the early 1990s, Jefferson and Coaches had split off, and Poplar had eroded to only a few acres. An Army Corps-MD Port Administration project was funded in the mid 1990s, and construction of a large contained dredge material disposal- "Beneficial Use" facility was begun in 1999. Wetland cell planting began in 2003 in one cell. The future plan for restoration calls for a 50:50 mix of upland habitat and tidal marshes. Shell/sand islands have been especially designed to attract terns within the wetland cells. Target breeding species to attract are: Least and Common Terns, Snowy Egrets (and other waders), Ospreys, American Black Ducks, and American Oystercatchers. For the past two years, more than 800 pairs of Common Terns and 60 pairs of Least Terns have attempted nesting, along with 5-6 pairs of Ospreys, and in 2004, about 50 pairs of Snowy Egrets. The terns have produced no fledglings however either in 2003 or 2004, and research is underway to determine factors. Egrets, in contrast, did very well in 2004, as did Ospreys. Along with these species, however, came > 400 pairs of Double-crested Cormorants, Herring and Great Black-backed Gulls, Canada Geese and Mute Swans. USDA has implemented partial control measures.

57. DOES INCUBATION REDUCE MICROBIAL GROWTH ON EGG SHELLS AND INFECTION? ... WHY NOT! Steven R. Beissinger* and Mark I. Cook, Dept. of Environmental Science, Policy and Management, Univ. of California, Berkeley, CA 94720, Gary A. Toranzos, Dept. of Biology, University of Puerto Rico, San Juan, PR 00934 and Wayne J. Arendt, International Institute of Tropical Forestry, Luquillo PR 00773.

My favorite title of a Gene Morton paper - "*Avian Folivores, Why Not?*" - inspired this analysis of things that aren't supposed to be. Avian eggshells harbor microbes shortly after laying, and under appropriate ambient conditions they can multiply rapidly, penetrate through shell pores, infect egg contents and cause embryo mortality. We experimentally examined how incubation affects bacterial processes on the eggshells of Pearly-eyed Thrashers (*Margarops fuscatus*) nesting in tropical montane and lowland forests in Puerto Rico. Bacteria and fungi grew rapidly on shells of newly-laid, unincubated eggs exposed to ambient conditions, but declined to low levels on shells of eggs incubated by thrashers. Divergence in bacterial growth between incubated and exposed eggs was more marked at the montane forest than at the lowland site. Pathogenic microorganisms became increasingly dominant on shells of exposed eggs, but these groups were relatively rare on incubated eggs, where more benign, less invasive groups prevailed. Some incubation during laying may be necessary to decrease the probability of trans-shell infection by reducing the growth of harmful bacteria and fungi on eggshells, even though it may increase hatching asynchrony and the likelihood of brood reduction.

58. FIRE SUPPRESSION AND BACHMAN'S SPARROWS IN PINE FORESTS OF EASTERN TEXAS. Richard N. Conner*, Clifford E. Shackelford, Richard R. Schaefer, and Daniel Saenz, Southern Research Station, 506 Hayter Street, Nacogdoches, TX 75965.

We studied the effects of 8 years of fire suppression on shrub-level vegetation, Bachman's Sparrows (*Aimophila aestivalis*), and selected forest bird species between 1995 and 2003 in eastern Texas. Woody shrub-level vegetation between ground level and 3 m above the ground, measured using a leaf area index, increased significantly in all sites ($n = 20$) previously managed for Red-cockaded Woodpeckers (*Picoides borealis*) in both longleaf pine (*Pinus palustris*) and loblolly- (*P. taeda*) shortleaf (*P. echinata*) pine habitats. Woody shrub-level vegetation between ground level and 3 m also increased significantly in one-half of control sites ($n = 20$). During the 8 years, Bachman's Sparrow abundance decreased significantly in habitat management areas previously managed for Red-cockaded Woodpeckers. Brown-headed Nuthatches (*Sitta pusilla*), Indigo Buntings (*Passerina cyanea*) and Red-cockaded Woodpeckers also decreased in abundance, but this decrease was not statistically significant. Slight

increases or no changes were observed for Northern Cardinals (*Cardinalis cardinalis*), Carolina Wrens (*Thryothorus ludovicianus*), Hooded Warblers (*Wilsonia citrina*), Yellow-breasted Chats (*Icteria virens*), and White-eyed Vireos (*Vireo griseus*). These species generally are considered associates of woody shrub-level vegetation in forest habitat.

59. THE USE OF WILD BIRD EGGS TO MEASURE THE SENSITIVITY OF AVIAN EMBRYOS TO METHYLMERCURY. Gary H. Heinz* and David J. Hoffman, USGS Patuxent Wildlife Research Center, 10300 Baltimore Avenue, Beltsville, MD 20705.

Methylmercury accumulates in food chains of birds and is deposited in eggs. Results from captive breeding studies with Mallards (*Anas platyrhynchos*) have been used to establish a threshold of mercury in bird eggs that causes harm. Unfortunately, very little is known about the reproductive effects of mercury on wild birds, largely because of the great difficulty and expense of breeding them in captivity. As a practical substitute for captive breeding studies, we developed a technique for injecting the eggs of wild birds with methylmercury and measuring the effects on embryo survival. The eggs of many wild birds were collected in the field, and various doses of methylmercury were injected into the eggs. With game farm Mallard eggs hatching success was 76% for controls, and 56, 62, 53, 44, and 29% for eggs injected with 0.1, 0.2, 0.4, 0.8, and 1.6 ppm mercury, respectively. However, with White Ibis (*Eudocimus albus*) eggs, hatching success was 62% for controls and 10, 25, and 20% for eggs injected with 0.2, 0.4, and 0.8 ppm mercury, respectively. Eggs of some wild birds such as the Ibis proved to be more sensitive to methylmercury than were the eggs of Mallards. Estimates of harmful levels of mercury in eggs, which have been based on reproductive trials with Mallards in the lab, may have to be re-evaluated using techniques such as egg injections.

60. CERULEAN WARBLERS AND CANOPY HETEROGENEITY IN WEST VIRGINIA. Petra Bohall Wood, USGS WV Cooperative Fish and Wildlife Research Unit, Division of Forestry, West Virginia University, Morgantown, WV 26506.

Loss and/or degradation of forested habitats are factors considered important in population declines of Cerulean Warblers (*Dendroica cerulea*), a species being considered for listing under the Endangered Species Act. Additionally, growing evidence suggests that heterogeneous forest canopy is preferred by the species. Both anthropogenic and natural canopy disturbance can provide this structure. A series of studies in West Virginia have examined Cerulean Warbler presence, abundance, and territory density in relation to various types and intensities of edges and canopy disturbance. Generally, we have determined that large-scale edges such as reclaimed surface mines are avoided while certain types of internal, small-scale edges are used and/or preferred. Ridge-top areas and presence of snags (which increase canopy heterogeneity) relate to higher abundance and territory density. Clearcuts ~10-years-old are used by the species in very low numbers but presence of clearcuts does not limit use of adjacent forested habitats. Various types of canopy gaps are often incorporated into Cerulean Warbler territories on our study areas. In this presentation, I summarize data from these studies and relate our findings to habitat management for the species.

61. A RICE-AND-BIRDS SYNTHESIS: IS IT OUR “NEXT SHADE-GROWN COFFEE”? Paul J. Baicich, Swarovski Birding and National Wildlife Refuge Association, P.O. Box 404, Oxon Hill, MD 20750.

Rice ranks fifth in production-value among U.S. food crops, with the major rice-producing states - Arkansas, California, Florida, Louisiana, Texas, Mississippi, and Missouri, having approximately 3.4 million acres under cultivation. Anthropogenic habitats, acting as surrogates for natural habitats, continue to attract research. It is well known that different species of birds, e.g., waterfowl, shorebirds, and long-legged waders—will use rice-growing “habitat” in the United States. Various researchers have documented this use, focusing on different locations, species, and seasons (e.g., Hohman et al, 1994 and 1996, Elphick 2000, and Elphick and Oring 2002). Organic rice farming and the use of Integrated Pest Management systems in particular, may be favorable. Among waterfowlers, there are major efforts to promote “duck-friendly” ricefields to facilitate hunting. Among shorebird devotees, there have been attempts to communicate with the rice industry to increase available habitat through ricefield management and manipulation. While the research is encouraging and ongoing, and while best practices are in the process of being perfected, little has been done on the market-side—on consumer issues and the social sciences - to examine the potential for rice promotion vis-a-vis birds. In short, the question arises over whether rice (or specifically, organic rice) and be promoted much as “shade-grown coffee” has, but for a different suite of species.

62. WINTER NIGHT ROOST SELECTION BY BLACK AND GRAY-CROWNED ROSY-FINCHES IN NORTHEAST NEVADA. Peter V. Bradley*, Nevada Department of Wildlife, 60 Youth Center Rd, Elko, NV 89801, and Kenneth W. Voget, HC 60 Box 860, Ruby Valley, NV 89833.

Communal winter night roosts are a critical habitat component for black rosy-finch (*Leucosticte atrata*) and gray-crowned rosy-finch (*L. tephrocotis*) populations of the Great Basin. In 1993, for reasons of public safety, over

3,000 abandoned mines were closed in Nevada without the benefit of wildlife inventories prior to closure. Subsequent studies of extant mine shafts revealed significant night-roost use by communal flocks of wintering rosy-finches in the region. Mixed flocks of 400 finches were observed roosting in some shafts. Foraging flocks of 1,100 birds were observed and are likely roosting in similar numbers. While some 200,000 abandoned mines remain in the region, most are slated for closure. The numbers and locations of mines that contain microclimatic conditions suitable for rosy-finch night roosting is an unknown commodity. Given the potential for extensive habitat loss, a study was designed to determine distances from known rosy-finch foraging habitats to unknown night-roost locations as well as key night-roost features such as roost substrate, aspect, elevation and microclimate. Rosy-finch winter night roosts were found 8-9 km from foraging habitats and were primarily in abandoned mine shafts and in metamorphic rock outcrops. Roost locations provided shelter from typical winter storm patterns and were often located on leeward slopes and in south or east aspects. Roosts were found from 1,400-2,800 m in elevation in sage-steppe, mountain brush and pinyon juniper habitats. Roost temperatures remained 5-15 degrees F above freezing, even when ambient air was subzero. These data are assisting scientists in prioritization of abandoned mine assessment across the Region and in permanent protection of key rosy-finch winter roost sites.

63. A HUMOROUS LOOK AT A DEADLY CONSERVATION ISSUE: BIRDS AND GLASS. Daniel Klem, Jr., Department of Biology, Muhlenberg College, Allentown, PA 18104-5586.

For at least 20 years the threat that clear and reflective plate glass poses to birds has been the subject of comic media. Cartoons authored by several U.S. artists are used to review current knowledge and describe promising potential solutions to this unintended source of human-associated avian mortality. Billions of birds are estimated to be killed striking plate glass throughout the year and worldwide; select species such as the globally threatened Swift Parrot (*Lathamus discolor*) of Tasmania seem especially prone to suffer significant population losses. Recent international media coverage describing the glass hazard as a meaningful conservation issue for birds has attracted the attention of some building industry professionals. Collaborations between architects and avian conservationists promise to provide effective ideas to mitigate or eliminate window-kills at existing structures and in new construction.

64. * THE EFFECTS OF HABITAT LOSS ON THE SAVANNAH SPARROWS (*Passerculus sandwichensis*) OF LA PÉROUSE BAY, MANITOBA. Rachel Sturge*, Department of Zoology, University of Toronto, Toronto, ON; and Robert Rockwell, American Museum of Natural History, New York City, NY.

Due to the heavy grazing activities of Lesser Snow Geese (*Chen c. caerulescens*) found in and around the coastal salt marshes of La Pérouse Bay, Manitoba, the habitat has changed significantly, shifting from shrub-grassland to barren. This has negatively impacted the Savannah Sparrows (*Passerculus sandwichensis*) that breed there. Past work done by Rockwell and colleagues (Ecoscience 10(1): 33-37, 2003) has linked a 63% loss of shrub-grassland to a decline in the sparrows of 77%. To assess the effects of this habitat modification on the sparrows in further detail, we monitored male territories for nests and assessed the quality of these territories in terms of size and vegetation composition. We found that the mean size of shrub patches within a territory and the presence of sweet gale (*Merica gale*) are positively correlated with a male's ability to attract a mate while the Perimeter/Area ratio is negatively associated with this variable. The amount of shrub with a grass understory (which is the preferred nesting habitat for the sparrow population) was positively associated with fledging success. Our data were compared to historic data collected in the 1970s, and we found that the territory sizes had increased dramatically, while the breeding success had declined significantly, both in terms of mating and fledging success. These results show that, while the shift in vegetation from shrub-grassland to barren is an important aspect to understanding how habitat decline has affected the sparrows of La Pérouse Bay, other variables also play a role and need to be considered.

65. *FACTORS AFFECTING PARENTAL NEST ATTENDANCE IN NORTHERN MOCKINGBIRDS (*Mimus polyglottos*). Michael F. Gaydos* and George L. Farnsworth, Department of Biology, Xavier University, Cincinnati, OH 45205.

Parents of altricial chicks are faced with the dilemma of balancing the time spent at the nest and the time spent away foraging. This study was undertaken to investigate the effect of several environmental factors on the time spent at the nest for each visit by breeding Northern Mockingbirds (*Mimus polyglottos*). Data was collected during the 2004 breeding season on Xavier University's campus in Cincinnati Ohio. A total of six nests from four breeding pairs totaled 627 individual visits. For each visit the time was recorded when a parent arrived at the nest tree and when the parent left. The date, temperature, an index of cloud cover, an index of wind strength, age of the chicks, and brood size were recorded for each observation. The data was subjected to a backwards elimination regression model to determine which factors had the most significant effect on time spent by a parent at the nest. After identifying the main effects some key interactions were evaluated using an additional regression. Regression results indicated the best environmental predictors were: age, temperature, an interaction between chick age and number of

chicks, and the interaction between chick age and temperature ($p < 0.05$). Age and temperature main effects showed a negative correlation with time spent at the nest; whereas the two interactions showed a positive correlation with the amount of time spent at the nest. In conclusion, environmental factors may play an important role on the decision to forage or stay at the nest.

66. MALE PARENTAL EFFORT AT LOW AND HIGH ELEVATIONS IN A WYOMING POPULATION OF MOUNTAIN BLUEBIRDS. L. Scott Johnson, Emilene Ostlind, and Susan L. Balenger, Dept. of Biology, Towson University, Towson MD 21252.

Some species of birds breed along extensive elevational gradients in mountainous areas. Few studies have asked how life history traits change as elevation increases. Badyaev and Ghalambor (2001, *Ecology*, 82: 2948) compared male and female parental effort in 20 pairs of passerine groups (primarily subspecies or congeners) where one member of each pair bred at either a low or high elevation. In 16 of 20 cases, the proportion of feeding trips made by males was greater for the high elevation representative. They argued that harsher, less predictable climatic conditions at higher elevations selects for greater male involvement in offspring care. Very few studies have examined how birds within populations of a single species respond to an elevational gradient. We compared paternal effort in Mountain Bluebirds (*Sialia currucoides*) breeding at ~1300 and ~2500 m in Wyoming's Bighorn Mountains in 2004. Observations were made late in the nestling stage when little if any brooding by females occurs. Both males and females made more feeding trips per nestling at the high site; however, broods were smaller at this site. The percent of trips made by males was almost identical at the high and low sites (42.0 vs. 42.6%, respectively). We discuss the relevance of our findings to sexual selection in this highly ornamented, socially monogamous species.

67. FATE AND PRODUCTIVITY OF BEACH NESTING AMERICAN OYSTERCATCHERS, CUMBERLAND ISLAND NATIONAL SEASHORE, GEORGIA. John B. Sabine* and Sara H. Schweitzer, D. B. Warnell School of Forest Resources, University of Georgia, Athens, GA 30602, and J. Michael Meyers, USGS Patuxent Wildlife Research Center, D. B. Warnell School of Forest Resources, University of Georgia, Athens, GA 30602.

Human disturbance and predation may contribute to low reproductive success for American oystercatchers at Cumberland Island National Seashore (CINS), Georgia; however, no recent studies have focused on identification of causes of egg and hatchling losses. We used continuous video monitoring to document reproductive success of American Oystercatchers and identify causes of nest failure at CINS, from 2003-2004. We used the modified Mayfield method and the program CONTRAST to determine and compare survival of eggs and nestlings from 32 nest attempts during two seasons. Nine attempts were successful, fledging 15 chicks. Daily survival was 0.9732 (95% CI = 0.9598 - 0.9866) for 2003, 0.9846 (95% CI = 0.9740 - 0.9952) for 2004, and 0.9787 (95% CI = 0.9701 - 0.9873) for combined years. Daily survival of clutches was greater on the North end than on the South end of the island ($\chi^2 = 7.211$, $df = 1$, $P = 0.0072$). We documented 18 of 20 nest failures during the egg stage. Because of chick mobility, we only documented 1 of 8 chick losses. We identified 3 egg predators: raccoon (*Procyon lotor*, $n = 9$), bobcat (*Lynx rufus*, $n = 3$), and American crow (*Corvus brachyrhynchos*, $n = 1$). The chick was depredated by ghost crab (*Ocypode quadata*). Other causes of nest failure included tidal overwash ($n = 1$), horse trampling ($n = 1$), abandonment ($n = 2$), and destruction by a small child ($n = 1$). Predator control may be an effective means of increasing reproductive success on the South end. The North end may serve as an important source of fledglings in Georgia and should be preserved.

68. *BURROWING OWL NEST SITE SELECTION ON THE JANOS-NUEVO CASAS GRANDES, MEXICO PRAIRIE DOG COMPLEX. Jennifer McNicoll* and Martha Desmond, Department of Fishery and Wildlife Sciences, and Leigh Murray, University Statistics Center, New Mexico State University, Las Cruces, NM 88003.

We modeled local and landscape level parameters related to nest site selection for Burrowing Owls (*Athene cunicularia*) on prairie dog colonies in northwest Chihuahua Mexico; one of the largest remaining black-tailed prairie dog (*Cynomys ludovicianus*) complexes. We surveyed 26 colonies for owls, and over the two years located 601 nests. We examined nest-site selection at the level of the Burrowing Owl cluster; owls nest in aggregations within prairie dog colonies. Burrowing Owl clusters within 22 of the surveyed colonies were used for modeling nest site selection each year. Nest site selection was modeled using Akaike's Information Criterion. Prior to data collection, we *a priori* selected seven variables to examine in relation to nest site selection at the local and landscape scales. Variables with the most support in our top models for influencing nest site selection at the cluster level were degree of isolation, nearest neighbor distance and prairie dog colony size in 2003 and degree of isolation, nearest neighbor distance, historic site-use and percent agriculture in 2004. Nearest neighbor distance was negatively and degree of isolation positively associated with the number of nesting pairs in a cluster. Nesting densities were highest in small colonies that were more isolated from other prairie dog colonies suggesting the importance of a large complex with numerous colonies available as breeding areas for Burrowing Owls. Colonies used the first season

were preferentially used in the second season. This data supports the proposed designation of the Janos-Nuevo Casas Grandes Prairie Dog Complex as a biosphere reserve.

69. SURVIVORSHIP AND TERRITORY FIDELITY OF RED-EYED VIREOS (*VIREO OLIVACEUS*). Paul Callo, Department of Biology, Mary Baldwin College, Staunton, VA 24401.

I have captured, banded, and mapped territory locations of a population of Red-eyed Vireos at the Hemlock Hill Biological Research Area (HHBRA) in northwest Pennsylvania from 1999 to 2004 and at the Smithsonian Environmental Research Center (SERC) in Edgewater, Maryland over the years 2000-2002. A comparison of these two populations reveals differences between the populations in rates of return, territory fidelity, and territory switching. On average 39% of HHBRA Red-eyed Vireos return from one year to the next and an average of 25% return at SERC. Based on the consequent vacancy rate, if males are competing for the best quality territories it was expected that there would be substantial territory switching by males from year to year. However, most males returned to the same territory (HHBRA 79%, SERC 68%) despite territory vacancies. This suggests that 1) territories are not appreciably dissimilar in quality and/or 2) familiarity is a more important determinate of territory selection. Possible explanations for these differences and additional demographic comparisons are presented.

70. THE INFLUENCE OF LUNAR CONDITION ON THE DETECTION RATE OF THE WHIP-POOR-WILL (*CAPRIMULGUS VOCIFEROUS*): IMPLICATIONS FOR LARGE-SCALE MONITORING PROGRAMS. Michael D. Wilson* and Bryan D. Watts, Center for Conservation Biology, Department of Biology, College of William and Mary, Williamsburg, VA 23187-8795.

Understanding the variation in the detectability of birds is fundamental to determining the reliability of a given survey method. We examined the influence of lunar light conditions on the detection probability of Whip-poor-will's through a repeated sampling of 78 point count stations over two lunar cycles. The probability of detection was positively related to the lunar light intensity measured as the percent of moonface illuminated and moon height above the horizon. Surveys conducted on nights when the moon was less than half full were significantly more variable compared to nights when the moon was more than half full (CV = .58 and .27 respectively). Using a fixed survey time to control for the influence of lunar condition on Whip-poor-will surveys will increase the precision of survey efforts. This inevitably adds statistical power to large-scale monitoring programs so that better conclusions may be drawn from survey data.

71. THE INFLUENCE OF LANDSCAPE CONFIGURATION ON THE DISTRIBUTION AND ABUNDANCE OF THE WHIP-POOR-WILL (*CAPRIMULGUS VOCIFEROUS*). Michael D. Wilson* and Bryan D. Watts, Center for Conservation Biology, Department of Biology, College of William and Mary, Williamsburg, VA 23187-8795.

We examined the influence of landscape configuration on the distribution and abundance of Whip-poor-wills during the breeding season. We compared abundance within forest-regeneration complexes to forest-forest complexes. Forest-regeneration complexes supported a greater abundance of Whip-poor-wills compared to forest-forest complexes. Whip-poor-wills in forest-regeneration complexes were most frequently detected within 100m of the physical edge between forest and regenerating stands. These combined results indicate how landscape-level patterns in Whip-poor-will abundance are related to combined gradients of patch size, forest-edge ratios, and the amount of forest being harvested in the landscape. The positive edge response of Whip-poor-wills to landscape structure is likely due to the proximity and use of foraging habitats. A relatively high number of habitat openings created by forest regeneration practices provide Whip-poor-wills with foraging opportunities not present in less intensively managed forest systems. Because patch structure within managed landscapes change through time, management options for Whip-poor-wills should consider harvest strategies that maintain the availability of appropriate patch complexes.

72. *THE MICROBIAL ECOLOGY IN THE PLUMAGE OF NEOTROPICAL MIGRANTS. Kate E. Williamson*, Department of Biological Sciences, University of Northern Colorado, Greeley, CO 80631, and Edward H. Burt, Jr., Department of Zoology, Ohio Wesleyan University, Delaware, OH 43015.

The microbial community in the plumage of neotropical migrants is influenced by many factors, such as time of migration, sex, and health. During different weeks of the spring migration periods of 2000-2004, migrants were sampled as they arrived on the southwest coast of Louisiana. Birds that arrived in late April had a more abundant microflora than birds that arrived in early April. Females had significantly higher microbial loads than males in sexually dimorphic species in which males migrate earlier than females. Males had significantly higher microbial loads than females in sexually dimorphic species in which males and females migrate at the same time. As fat deposits, and therefore health, increased, microbial abundance decreased. These data suggest the abundance of the microflora in the plumage of neotropical migrants is influenced by environmental, physiological and behavioral

differences resulting from migration. More research is needed to determine if this variable microflora affects the further migration and reproductive future of these birds.

73. *FEATHER DAMAGE IN AN ALBINO GREATER FRIGATEBIRD. Ralph W. Schreiber† and Elizabeth A. Schreiber, National Museum of Natural History, Bird Department MRC 116, Smithsonian Institution, Washington, D.C. 20560; Ashley M. Peele* and Edward H. Burt, Jr., Department of Zoology, Ohio Wesleyan University, Delaware, OH 43015.

On 11 July 1982, Ralph and B.A. Schreiber collected an albino juvenile Greater Frigatebird on Christmas Island (2°N, 157°W) in the tropical Pacific. The wings and tail were severely abraded. The wings measured 462 mm, 80% of normal for a juvenile from Christmas Island, and the tail 199 mm, 54% of normal length. The bird, estimated to be 14 months old, was unable to fly when collected. Normal, black juvenile Greater Frigatebirds have little or no damage to their wing and tail feathers at 14 months age. What is different about albino feathers, which lack melanin, that can account for the broken shafts, missing and broken barbs, and lost barbules seen on this albino frigatebird? The pattern of damage corresponds to the pattern of turbulence around a flying bird (Burt, AOU Monograph 38: 1–126, 1986.). Severe abrasion occurred from the outermost primary to the innermost secondary feather and all tail feathers. We quantified the damage by measuring the rachis and barb lengths, barb count along the rachis, and tangential packing of barbs on the primary, secondary, tail, and selected body feathers. We used scanning electron microscopy to look at the surface and internal structure of barbs and barbules of the damaged and undamaged barbs. All measurements were replicated on a normal juvenile Greater Frigatebird, also 14 months old. We will discuss how our comparative data suggest the effect of melanin in strengthening the structure of dark feathers.

74. *ANALYSIS OF FEATHER-DEGRADATION BY *BACILLUS LICHENIFORMIS* FROM THE PLUMAGE OF BOTTERI'S SPARROWS LIVING IN WET AND DRY HABITATS IN ARIZONA. George S. Hamaoui Jr.*, Department of Botany-Microbiology, Ohio Wesleyan University, Delaware, OH 43015, and Edward H. Burt, Jr., Department of Zoology, Ohio Wesleyan University, Delaware, OH 43015.

Strains of the bacterium *Bacillus licheniformis* isolated from the plumage of Song Sparrows (*Melospiza melodia morphna*) occupying humid habitats in northwestern Washington degraded feathers more rapidly and more completely than strains from Song Sparrows (*M. m. fallax*) occupying arid habitats in southeastern Arizona. In this study we analyzed the feather-degrading ability of *B. licheniformis* isolated from the plumage of a single population of Botteri's Sparrows (*Aimophila botterii*) some of which occupied low lying, wet washes while others occupied high, arid mesas near Elgin, Arizona. Unlike the populations of Song Sparrows, which were separated by thousands of kilometers, the different habitats of Botteri's Sparrows were adjacent to each other. *B. licheniformis* from the plumage of sparrows in the wash and *B. licheniformis* from the plumage of sparrows on the mesa degraded feathers at similar rates. Furthermore, we found no significant difference in the occurrence of feather-degrading and non feather-degrading *B. licheniformis* in the plumage of sparrows from the wash and those from the mesa. The difference in feather-degrading ability of *B. licheniformis* on Song Sparrows from wet and dry climates is not present in *B. licheniformis* on Botteri's Sparrows from wet and dry habitats. Apparently, differences in the feather-degrading ability of *B. licheniformis* from Song Sparrows are not facultative responses to temporary exposure to different habitats but rather an evolutionary response of widely separated bacterial populations exposed to different climates over long time periods.

75. ROOSTING BEHAVIOR OF THE NORTHERN WATERTHRUSH DURING THE NON-BREEDING SEASON. Joseph Smith* and Peter P. Marra, Smithsonian Environmental Research Center, Edgewater, MD; and Leonard R. Reitsma, Dept. Nat. Sci., Plymouth State University, Plymouth, NH.

Several species of Nearctic Neotropical migratory songbirds appear to form roosting aggregations while on their wintering grounds. We studied the Northern Waterthrush (*Seiurus noveboracensis*), during three winter periods between 2002 and 2004 in Puerto Rico to describe roosting behavior and patterns of roost habitat selection. Regardless of the diurnal habitat used, 87% of Northern Waterthrush selected dense stands of coastal red mangrove for roost sites. Individuals traveled up to 2 km to access roost sites in this habitat. We found inconclusive evidence of communal roosting in this species. Patterns of roost site selection did not vary by sex, but did vary by aggressive response to playback. Individuals showing aggressive response to playback and decoy during the day were significantly closer to the coast at night compared to those that did not. Stands of red mangrove were selected for roosting sites disproportionately to their availability. Coupled with observations of numerous other species using this habitat for roosting sites, red mangroves may constitute an important habitat for bird populations that live in proximity to mangrove areas in the American tropics.

76. *TRIVIAL CHANGES AND FEEDING RANGES: HOW SLIGHT PHYSIOGNOMIC ADJUSTMENTS OF FIELD MARGIN HABITAT MAY ELIMINATE 'DEAD FORAGING ZONES' IN ADJACENT CROP FIELDS. Ross Robert Conover* and Eric T. Linder, Department of Biological Sciences, Mississippi State University, Mississippi State, Mississippi 39762.

The Mississippi Alluvial Valley (MAV) provides wintering habitat for seventeen grassland emberizids, six of which are species of conservation concern in winter. The waste grain of MAV farm fields is likely a principal forage resource for these emberizids, however, many species' cover-dependence limits their ability to exploit this resource. Recently, herbaceous borders that abut field-margin wood lines have proliferated throughout the MAV to improve wildlife habitat along field-wood line edge habitat. Our previous research on wintering avian communities suggests wintering sparrows more readily forage in crop fields adjacent to wide-bordered margins than non or narrow-bordered field margins. This response may potentially generate a 20-50 m 'dead forage zone' that flanks inadequately bordered margins. In winter, the perpetually diminishing seed resource is a primary limiting factor of granivorous bird survival; hence, their ability to access such a resource is paramount. This study investigated the foraging patterns of cover-dependent and independent sparrows in crop fields adjacent to margins with borders of differing widths. Foraging behavior of sparrows was tested among border widths by establishing seed plots at varying distances into adjacent fields. Plots were randomly baited and videoed throughout February 2005 to record species' occurrence, visit frequency, flock size, and visit duration at each plot. The relationship between plot location and observed variables will be analyzed to identify an optimal border width. Preliminary evidence has disclosed the ineffectiveness of field margins with <20 m wide herbaceous border. The recognition of an optimal border width will pioneer the standardization of proper field border physiognomic management protocols, thereby assuring suitable wildlife habitat.

77. *GETTING TO THE POINT: RECTRIX SHAPE MORPHOMETRICS IN AGE DISCRIMINATION OF OVENBIRDS. Kristen M. Covino*, Joanna M. Panasiewicz, Sara R. Morris, and H. David Sheets; Departments of Biology and Physics, Canisius College, Buffalo, NY 14208.

Recently, bird banders have increased their certainty in determining the age of many passerine birds by incorporating a variety of characteristics including molt limits and feather shape. Previous studies using visual inspection or tip angle have shown that the outer rectrix tip shape differs between age groups in passerines; the rectrices are truncate in older birds and pointed in younger ones. In this study, we used a set of techniques known as geometric morphometrics to quantify the overall shape of Ovenbird (*Seiurus aurocapilla*) tail feathers. Specifically, we used two methods of semi-landmark-based morphometrics (perpendicular projection and bending energy alignment) along with an outline-based morphometric method to compare age groups. We measured points on the periphery of a digital image of the right fifth rectrix of 23 hatch-year (HY) and 23 after-hatch-year (AHY) specimens. The results indicate that all of the three methods used in this study were able to discriminate between HY and AHY individuals based on the overall shape of the fifth rectrix. Additionally the two semi-landmark methods were able to discriminate between the two age groups based on only the shape of the tip of the rectrix. Thus, our results indicate that all three geometric morphometric methods provide the same overall pattern, although the accuracy in discriminating between age classes varied slightly.

78. *NUMERICAL COMPETENCE IN WILD NORTHERN MOCKINGBIRDS (*Mimus polyglottos*). Jennifer L. Smolinski* and George L. Farnsworth, Department of Biology, Xavier University, Cincinnati, OH 45207.

The purpose of this study was to determine the numerical competence of wild Northern Mockingbirds (*Mimus polyglottos*). Five individually color-banded mockingbirds on established winter territories on the campus of Xavier University in southwestern Ohio were presented with transparent acrylic bird feeders designed to test numerical competence. Each feeder had six holes drilled on either side so that bamboo sticks could be easily inserted and removed. To obtain mealworms from the feeder, a mockingbird needed to remove all sticks on one side of the apparatus. If mockingbirds possessed numerical competence, we hypothesized that they would remove sticks from the side of the feeder that contained fewer sticks, thus more quickly and easily receiving a food reward. The birds were presented with trials involving random placement and number of sticks: initially one stick on one side and six sticks on the other side (1 vs. 6), then 2 vs. 5, and 3 vs. 4. Statistical analysis of the data was carried out using one-tailed sign tests. In the 1 vs. 6 and 2 vs. 5 trials, all five subjects showed a statistically significant preference for the side of the feeder containing fewer sticks (all $P < 0.05$). All five subjects failed, however, to discriminate between 3 vs. 4 (all $P > 0.05$). The results of this study demonstrate the ability of wild birds to solve optimal foraging problems on the basis of number.

79. RECOMMENDATIONS FOR RANGEWIDE POPULATION TREND MONITORING OF NORTH AMERICAN LANDBIRDS. Terrell D. Rich, USFWS and Partners in Flight, Boise, ID 83709.

Partners in Flight has completed an assessment of the rangewide population monitoring needs of the 448 species of landbirds that regularly breed in the US and Canada. In the North American Landbird Conservation Plan, population trend over the past 30 years was one of six criteria used to assess level of conservation concern for each species. Data from the Breeding Bird Survey (BBS) were used whenever possible to assign population trend scores. There were 182 species for which BBS provided data of acceptable quality. For each species not adequately monitored, we identified the single monitoring approach that would most effectively address information gaps. Improving the quality of BBS will be the most efficient means of improving our knowledge for 33 species. Another 59 species can be adequately assessed with properly designed multi-species boreal surveys while Mexican/Caribbean surveys can improve our knowledge of another 48 species. Other recommended new multi-species breeding season surveys include those for the Arctic and for South America. We recommend targeted breeding season surveys for high elevations, early spring, nocturnal, southwest border birds, and for some individual species. Winter and migration monitoring is recommended primarily as a second choice for most species. This analysis is intended to be used by the Monitoring Subcommittee of the North American Bird Conservation Initiative in continuing work to implement coordinated bird monitoring across the continent.

80. ART IN SCIENCE: THE CONTRIBUTIONS OF GEORGE MIKSCH SUTTON. Jerome A. Jackson, Whitaker Eminent Scholar in Science, Florida Gulf Coast University, 10501 FGCU Blvd. South, Ft. Myers, FL 33965.

George Miksch Sutton is known best for his contributions to science and for his bird art. In addition to his accurate portrayal of birds, his art often had scientific value, documenting nuances of plumage and flesh colors. His artistic contributions to science, however, were occasionally inaccurate, improving as his knowledge and understanding of birds grew. His scientific and science education contributions through art extended beyond birds to include many other taxa. In this presentation I will review the development and breadth of Sutton's artistic contributions to science.

81. TURKEY VULTURE NESTLING TRAVEL, SASKATCHEWAN TO COSTA RICA. C. Stuart Houston*, 863 University Drive, Saskatoon, SK S7N 0J8, and Brenton Terry, 64 MacLean Crescent, Saskatoon, SK S7J 2R7.

In Saskatchewan, 44 Turkey Vulture nestlings, in deserted houses, have had patagial tags applied to the right wing without known adverse effects. This is the first major Turkey Vulture nestling patagial tagging project since 49 were wing-tagged by JD Bittner in Ohio, 1975-1979. One Saskatchewan nestling received in addition a body-harness radio transmitter on August 6, 2004. It left its nest site on September 22. Its longest one-day travels were 634 km (to Volga, South Dakota on October 1) and 381 km (to La Compana, Vera Cruz, on November 5). It rested for four days near Sioux City, Iowa, five days north of Omaha, Nebraska, and four days near San Antonio, Texas, lagging well behind the main flocks of this species. It reached coffee plantations on steep slopes south of San José, Costa Rica, 5300 km from its natal origin, on December 10. It has wintered largely within a 40-km diameter circle, where it has been photographed by wildlife photographer Marco Saborio. Historical marking of this species in North America, 1920-1998, included 2,144 with leg bands and 567 with patagial tags. Please scrutinize each Turkey Vulture for white numbers on a green tag on the right wing.

82. OSPREYS A LA FAABORG. Paul R. Spitzer, Cooperative Oxford Lab, 904 S. Morris St., Oxford, MD 21654.

The osprey is perhaps our largest neotropical migrant, and the first to return for breeding in this region, in March. Many East Coast ospreys form breeding clusters in fragmented habitats: Estuaries, embayments, islands, peninsulas. Thus they can be subjected to a Faaborgian analysis, as John does with passerines in his 2002 book "Saving Migrant Birds" (U. Texas Press). In contrast to passerines, banded ospreys yield hard-to-obtain population parameters such as adult survival rates and fledging-to-breeding dispersal. Cumulative studies since the late 1960's argue that the "source-sink" concept does not apply to East Coast ospreys—that each fragment succeeds or fails independent of immigration. Supportive data from Chesapeake Bay (MD/VA); Atlantic coastal NJ; Long Island, NY; and coastal southern New England will be presented. Male ospreys are conservative dispersers, thus "founder" males are the key to colonizing new habitat ents. Evolutionary and ecological explanations for this will be discussed. Ospreys demonstrate strong sexual selection.

83. DNA REPEAT ARRAYS IN CHICKEN AND HUMAN GENOMES AND THE ADAPTIVE EVOLUTION OF AVIAN GENOME SIZE. Austin L. Hughes* and Helen Piontkivska, Department of Biological Sciences, University of South Carolina, Columbia SC 29208.

Birds have smaller average genome sizes than other tetrapod classes, and it has been proposed that a relatively low frequency of repeating DNA is one factor in reduction of avian genome sizes. DNA repeat arrays on chicken (*Gallus gallus*) autosomes were quantified and compared with those in human autosomes. In the chicken 10.3% of

the genome was occupied by DNA repeats, in contrast to 44.9% in human. In the chicken, the percentage of a chromosome occupied by repeats was positively correlated with chromosome length, but even the largest chicken chromosomes had repeat densities much lower than those in human, indicating that avoidance of repeats in the chicken is not confined to minichromosomes. When 294 simple sequence repeat types shared between chicken and human genomes were compared, mean repeat array length and maximum repeat array length were significantly lower in the chicken than in human. The fact that the chicken simple sequence repeat arrays were consistently smaller than arrays of the same type in human is evidence that the reduction in repeat array length in the chicken has involved numerous independent evolutionary events. This implies that reduction of DNA repeats in birds is the result of adaptive evolution, presumably related to the reduction of cell size and consequent advantages for the energetic demands of flight.

POSTER PRESENTATIONS

P1. *DEFINING SPECIES LIMITS THROUGH COLOR: ANALYSIS OF THE ORCHARD ORIOLE COMPLEX. Ian E. Tracy* and Chris Hofmann, Kevin E. Omland, Department of Biological Sciences, University of Maryland, Baltimore County, Baltimore, Md 21250.

The Orchard Oriole (*Icterus spurius spurius*) and the Fuertes's Oriole (*Icterus spurius fuertesii*) are two closely related orioles believed to have recently diverged. These two orioles have geographically distinct breeding areas: the Fuertes's Oriole breeds in Mexico, and the Orchard Oriole Breeds in the eastern United States. These orioles also differ in plumage coloration. Male Orchard Orioles generally appear chestnut whereas Fuertes's Orioles are described as ochre, however quantitative analysis of the color differences are lacking. To further define these differences we used a reflectance spectrometer to gather quantitative color measurements of plumage. We found that Orchard and Fuertes's Orioles color plumage has a unique spectral shape. Analysis of reflectance spectra indicates no overlap in color between Orchard and Fuertes's Orioles. These findings provide further support for classifying the Orchard and Fuertes's Oriole as separate species. (Research sponsored in part by The Arnold and Mabel Beckman Foundation.)

P2. *PHYLOGENETICS AND PHYLOGEOGRAPHY OF THE WHITE GOOSE COMPLEX, GENUS *Chen*: IS MOTHER GOOSE SPINNING A NEW TALE? Elizabeth Humphries*, Jeffrey L. Peters and Kevin E. Omland, Dept. Biol. Sci., University of Maryland Baltimore County, Baltimore, MD 21250 and Jón E. Jónsson and Alan D. Afton, USGS - LA Wildl. and Fish. Coop. Res. Unit and School for Renewable Resources, Louisiana State Univ., Baton Rouge, LA 70803.

The White Goose Complex of North America presents one of the most complicated and intriguing genetic problems in ornithology today. This complex consists of three taxa, the Ross's Goose (*Chen rossii*), the Lesser Snow Goose (*C. caerulescens caerulescens*) and the Greater Snow Goose (*C. c. atlantica*). Previous genetic studies of this complex have shown two highly divergent lineages in mitochondrial DNA present in all three taxa. Two hypotheses have been proposed to account for this lineage sharing - ancestral polymorphism and hybridization. We further examined these hypotheses by sequencing 658 base pairs of the mitochondrial DNA control region from 10 to 40 individuals of the three taxa. A widespread common haplotype with a central position in the haplotype network was shared by all three taxa. This pattern is consistent with ancestral polymorphism. However, several rare haplotypes were also shared among taxa, perhaps suggesting the influence of hybridization. More sophisticated coalescent-based methods of inference and analysis of nuclear loci are needed to better elucidate the complex phylogenetic and phylogeographic history of the White Geese.

P3. *POSSIBLE DOUBLE BROODING IN TEMPERATE-BREEDING ORIOLES: BREEDING BEHAVIOR OF BALTIMORE ORIOLES IN MARYLAND. Spring Ligi* and Kevin Omland, Department of Biological Sciences, University of Maryland Baltimore County, Baltimore, MD 21250.

Previous studies suggest that tropical birds often rear multiple broods per breeding season while temperate birds are more likely to rear one brood per season. However, we have recently documented the first three cases of double brooding in the Orchard Oriole (*Icterus spurius*), a temperate and migratory species. Here, we propose to determine whether double brooding occurs in another temperate and migratory species, the Baltimore Oriole (*I. galbula*), during the 2005 breeding season. Nesting behaviors for both Baltimore and Orchard orioles will be observed from nest construction to post-fledgling care. Orioles will be caught using mist nets, banded, and measured (weight, bill size, wing and tarsus length). Measurements and nesting observations will provide information concerning which (if any) individuals rear two broods, the success of second compared to first nests, and the impact of double brooding on molting and migratory timing. Comparing measurements between single and double brooded individuals should reveal any characteristics associated primarily with double brooding individuals.

This behavioral study will enhance current knowledge of oriole breeding, an important life history trait, and contribute to the general understanding of differences between tropical and temperate birds.

P4. *INTER-YEAR DISTANCE BETWEEN NEST SITES OF WOOD THRUSH WITH RESPECT TO AGE, SEX, PREVIOUS YEAR'S SUCCESS AND MATE'S AGE. Lisa Vormwald*, Roland Roth, Isis Johnson, and J. L. Bowman, Department of Entomology and Wildlife Ecology, University of Delaware, Newark, DE 19716.

Territorial location and nest placement influence fledging success. Therefore, selection should favor adults that return to sites where they were previously successful and avoid previously less successful sites. Age and sex may also affect site fidelity. We tested that logic with 1974-2002 data for Wood Thrushes (*Hylocichla mustelina*) nesting in a 15 ha woods (UDW) in northern Delaware. We tested for relationships between pertinent independent variables and our measure of site fidelity (BYD), the distance between the first nest of a returning bird in Year X +1 and its first nest in the previous year X. We predicted that males, older birds, birds previously mated to older birds, and birds with more success in Year X would have the smaller BYDs, i.e., greater site fidelity. Males tended to have lower BYDs than females. Among males, BYD was not significantly related to any of the variables (all $p \geq 0.15$). For females, BYD was significantly related only to age of the previous year's mate ($p = 0.05$), but that variable explained little of the variation in BYD ($r^2 = 0.04$). Although not statistically significant, BYD tended to decline at greater ages and levels of productivity. The low r^2 values indicate that other factors, e.g., age-based dominance and arrival times of returnees, also affected the birds' settling locations. Finally, the 15-ha size of UDW may have limited how far returnees could move from their previous year's nest thereby reducing the variation in BYD.

P5. *CAN WOOD THRUSH GROWTH BE MODELED USING A NON-PARAMETRIC SPLINE ESTIMATOR? W.P. Brown¹, P. Eggermont², V. LaRiccia², R.R. Roth¹, ¹Department of Entomology and Wildlife Ecology and ²Department of Food and Resource Economics, University of Delaware, Newark, DE 19716-2130.

Traditional, parametric models of sigmoidal growth patterns do not capture negative, sometimes subtle, changes in growth rates. We evaluated the fit of three traditional growth models (logistic, Gompertz, and von Bertalanffy) and a non-parametric spline estimator to a large data set of Wood Thrush (*Hylocichla mustelina*) mass (g) observations. The spline estimator fit the growth data better than the parametric models, produced more realistic and accurate confidence intervals, and indicated negative changes in growth rates at relevant life history stages that were not detected by the parametric models. To assess the generality of these findings, we further evaluated the fit among models using simulation procedures. The logistic and Gompertz models appeared to be the most flexible over small sample sizes for specified mean models that were strictly sigmoidal in shape. For moderate sample sizes, the spline estimator best fit specified mean models of all shapes, except when the model being fitted exactly matched the specified mean model. Importantly, confidence intervals for all of the parametric models were not at all accurate. Confidence intervals of the spline estimator were acceptable at all sample sizes and for all specified models.

P6. *SURVIVAL OF BROWN-HEADED COWBIRD AND WOOD THRUSH EGGS AND YOUNG IN WOOD THRUSH NESTS. Beth A. Wisotzky* and Roland Roth, Department of Entomology and Wildlife Ecology, The University of Delaware, Newark, DE 19716.

Rather than the usual focus on the success of host eggs and nestlings in parasitized nests, we looked at the less common topic: success of the parasite's eggs and young in an acceptor-species' nest. Specifically, we asked: are the eggs and young of Brown-headed Cowbirds (BHCO, *Molothrus ater*) as likely to disappear from Wood Thrush (WOTH, *Hylocichla mustelina*) nests as the host's eggs and young? Our data set came from the 1973-2003 WOTH nesting records at the University of Delaware Woods, Newark, DE (Brown and Roth 2002, Ecology 83: 958-969). We only used nests that held eggs or young of both species at the time of a loss of a single egg or young of either species and only ones for which contents from laying to loss were known. Among the 78 nests and 85 single-loss events, BHCB nestlings were six times more likely to disappear than Wood Thrush nestlings. No such difference occurred for eggs, losses of which closely reflected the actual distribution for each species. The distribution of egg and nestling losses differed significantly from random (Fisher's Exact Test, $p = 0.0002$). The disproportionate loss of BHCO nestlings, but not eggs, may lie in the nature of a brood parasite, especially one smaller than the host. Parasites may beg with louder calls than hosts to attract feeding by the adults. Such behavior could attract predators to the nest and to the cowbird in particular. To our knowledge, no test has been made of this possible explanation.

P7. POSSIBLE SEXUAL DIMORPHISM IN BREAST SPOTTING IN THE WOOD THRUSH AND ITS POTENTIAL FOR SEXING. Sara A. Kuebbing, R. R. Roth*, and J. L. Bowman, Department of Entomology and Wildlife Ecology, University of Delaware, Newark, DE 19716.

Sexual selection can result in sexual dimorphism to varying degrees in behavior, size, and plumage. Most male Wood Thrushes (WOTH, *Hylocichla mustelina*) are slightly larger than most females, but the species is

considered monomorphic in plumage (Roth et al. 1996). However, we have seen that the spotting on the white breast varies among individuals. Does the spotting differ by sex, and if so, do the differences offer a reliable sexing technique? We photographed the venter of 33 nesting WOTHS of known sex and age, each held in the same position. Using a transparency with a dotted grid aligned the same way over each photo, SAK counted the dots falling within a breast spot, on a spot's edge, and on white. The percent of white on the breast was the sum of dots touching white plus half of the edge contacts divided by the total dots counted on the grid. We compared the results by sex and age. We then tested if differences could be used for sexing. Novices sexed birds in photos aided only by reference photos and a brief description of thrush plumage. We repeated the test with a new set of photos but with half the group receiving further instruction on differences in spotting. In a field test, 4 persons with experience handling WOTHS used reference photos and written instructions to independently sex live birds. Females had more white on the breast than males (0.80 vs. 0.765, $P=0.006$); we found no difference among ages. Instruction did not improve accuracy of sexing from photos nor make recipients more accurate than uninstructed ones. Average overall score was 61%. In the field test, scores were 71, 57, 43, and 31%. Some degree of dimorphism may exist in breast spotting, but the differences were not distinct enough to be reliable as a sexing technique, at least with training we used.

P8. *CHARACTERISTICS OF REPEAT-PAIRS OF WOOD THRUSHES: SIZE, AGE, NESTING CHARACTERISTICS AND SUCCESS. Dana E. Long*, R. R. Roth, and W. P. Brown, Department of Entomology and Wildlife Ecology, University of Delaware, Newark, DE 19716.

We asked if between-year repeat pairs of Wood Thrushes (*Hylocichla mustelina*) differed from non-repeating pairs in biologically relevant ways in the year before the remating (Y1) that might explain stimuli for re-pairing and in the next year (Y2) any benefit from re-mating in Y2. Variables for Y1 were total fledged in year, number of nests built, fledging ≥ 1 WOTH (successes), and failing; number of eggs laid and number unhatched; and male and female age and wing chord. For Y2, we used the same list, excluding the two for eggs and adding date of first egg of year (possible benefit of earlier start) and two indicators of inattentiveness: total Brown-headed Cowbird (*Molothrus ater*) eggs laid and number of eggs and young lost. Using data for 1974-2004 from a banded Delaware population, we identified a data set of 93 repeat pairs and, for comparison, a set of random pairs from each year with as close to the same age composition as possible. In Y1, pairs that remated in Y2 reared more broods ($p=0.012$) and had fewer failures ($p=0.024$) than non-repeating pairs in Y1. Female wing chord of repeat pairs tended to be smaller than non-repeat females ($p=0.099$), the only other variable close to significance. Repeaters did not differ from non-repeaters for any variables in Y2. Whether the rematings represent a return to a successful mate or simply fidelity to a site and coincidental remating is unclear. Two pieces of evidence suggest the latter: (1) no evident benefit in Y2 and (2) the infrequency of rematings ($< 10\%$ of all pairings).

P9. *STOPOVER RATES AND DURATIONS OF MIGRANT NORTHERN SAW-WHET OWLS IN SOUTHERN PENNSYLVANIA. Michael S. Hurban*¹, Emily A. Caruana¹, Sarah M. Musilli¹, Scott Weidensaul², H. David Sheets¹, and Sara R. Morris¹, ¹Departments of Biology and Physics, Canisius College, 2001 Main St., Buffalo, NY 14208 ²Ned Smith Center for Nature and Art, P.O. Box 33, Millersburg, PA 17061.

Although Northern Saw-whet Owls are common migrants, little is known about the stopover ecology of this species. Using banding data collected on 2,374 Northern Saw-whet Owls from southern Pennsylvania, we investigated factors potentially affecting stopover rate and minimum stopover length. The likelihood of recapture was affected by date of capture, mass, and condition index in a logistic regression, although fat and keel scores were not significant factors in the model. Owls captured early in the season and owls with higher mass and condition index were more likely to be recaptured than later migrants and migrants with lower mass and condition index. Additionally, we found a significant difference in recapture rates among the six locations in this study. In contrast, we did not find any significant effects of date of capture, mass, condition index, fat score, or keel score on the length of minimum stopover, either treated independently or as part of a general linear model. The effect of mass and condition index on recapture rate contrasts with previous studies on migrant passerines that generally exhibit the opposite pattern. Sexual dimorphism and differential response to audio lures may be factors contributing to the effects of date and condition.

P10. *LOCATION, LOCATION, LOCATION: COMPARISON OF STOPOVER AT TWO SITES. Kathryn E. Mattern*, Canisius College, Buffalo, NY, Rebecca W. Suomala, University of New Hampshire, Durham, NH, and Melissa S. Mustillo, Peggy E. Buckley, Sara R. Morris, H. David Sheets, Canisius College, Buffalo, NY.

Migratory passerines utilize stopover sites to refuel fat stores, rest, and avoid predation. During fall migration, birds traveling from breeding to wintering grounds may stop at the Isles of Shoals in the Gulf of Maine. Because of differences in vegetation, migrants may be using individual islands differently. The goal of this project was to compare recapture rates and stopover lengths of migratory passerines on two islands, Appledore Island and

Star Island, in the Isles of Shoals during fall migration during 1999 and 2000. Five species had adequate banding records for comparison. Magnolia Warblers (*Dendroica magnolia*) had a greater recapture rate on Star Island during 2000, and Red-eyed Vireos (*Vireo olivaceus*) had a greater rate on Appledore Island during both 1999 and 2000. Stopover length was significantly longer on Appledore for both Northern Waterthrushes (*Seiurus noveboracensis*) during 1999 and Red-eyed Vireos during 2000. Only Red-eyed Vireos during 2000 could be compared using CMR models, they tended to stay on Appledore longer than Star Island. These results indicate that migrants are using these two sites differently, despite the proximity of the sites. Further study is needed to establish the factors affecting stopover decisions of migrants and how best to determine the importance of individual sites.

P11. *TIMING IS EVERYTHING: SEASONAL COMPARISON OF MIGRATORY STOPOVER. Melissa S. Mustillo*, Elizabeth H. Lewis, Kathryn E. Mattern, Sara R. Morris, and H. David Sheets, Departments of Biology and Physics, Canisius College, Buffalo, NY 14208.

Although migration is relatively widespread in birds, few studies have compared the two migratory seasons. Knowing that seasonal priorities of migrants may differ, the migration and stopover ecology of birds are also likely to differ between spring and fall. The goals of our project were to compare stopover ecology between spring and fall migration and to investigate possible annual variations. Using data from five species banded on Appledore Island, Maine, we compared recapture rates and stopover lengths (both minimum and SODA) between the seasons. The recapture rate for most species analyzed was significantly higher during fall. The minimum stopover was also longer during fall. When each year's record of Red-eyed Vireo (*Vireo olivaceus*) data was analyzed, there was a general pattern showing minimum stopover and SODA stopover to be longer during fall. Annual recapture rates for this species were also significantly higher during fall. It appears that there are seasonal differences in the stopover ecology of migrating birds. Birds have longer stopovers and higher rates of recapture during fall compared to spring. Our results are consistent with the hypothesis that avian behavior during spring migration is influenced by the need to arrive early on breeding grounds, while fall migrants are not time limited at this northern stopover site.

P12. *SEX-RELATED DIFFERENCES IN THE MIGRATION OF NORTHERN SAW-WHET OWLS. Sarah M. Musilli*, Michael S. Hurban, Emily A. Caruana, Canisius College, 2001 Main St., Buffalo, NY, 14208; Scott Weidensaul, Ned Smith Center for Nature and Art, P.O. Box 33, Millersburg, PA 17061; H. David Sheets, and Sara R. Morris, Canisius College, 2001 Main St., Buffalo, NY, 14208.

Northern Saw-whet Owls (*Aegolius acadicus*) are small, nocturnal, migratory owls that show reverse sexual size dimorphism, in which the females are larger than the males. Although little is known about their migratory patterns, they are believed to show differential migration, in which one sex migrates before the other. The analysis of 2,374 Northern Saw-whet Owls, banded in Pennsylvania during the fall migration seasons of 1998-2003, documented several sex-related differences in migration. Females were significantly larger than males, with higher masses and longer wing-chords. Females were in better body condition, having significantly higher condition indices (mass*100/wing chord) and keel scores. Although there were no differences found between the sexes in the date of arrival or the diel time of capture, males were captured at rates significantly lower than females, accounting for only 10% of the captures. Furthermore, males were recaptured significantly less frequently than females. The lack of male recaptures precluded additional comparisons of males and females with respect to stopover ecology. Additional study, particularly from other locations, is needed to determine whether the high capture rates of females is due to differential migration, differential capture probability, or both.

P13. *AGE-RELATED DIFFERENCES IN THE FALL MIGRATION OF NORTHERN SAW-WHET OWLS. Emily A. Caruana*, Sarah M. Musilli, Michael S. Hurban, Canisius College; Scott Weidensaul, Ned Smith Center for Nature and Art, P.O. Box 33, Millersburg, PA 17061; H. David Sheets, and Sara R. Morris, Departments of Biology and Physics, Canisius College, 2001 Main St., Buffalo, NY 14208.

Age-related differences in the fall migration of Northern Saw-whet Owls (*Aegolius acadicus*) in Pennsylvania were investigated during 1998-2003. Overall, 55.5% ($n = 2,369$) of owls captured during mist netting were hatch-year (young). During the six years of the study, the average date of arrival was significantly earlier for young owls than adult owls at these sites. Similar analyses of the annual timing of migration revealed significant differences in 1998, 1999, and 2001, but no significant difference in timing of migration for 2000, 2002, and 2003. Adult owls had significantly higher mass, and longer wing chords, but also had lower keel score (indicating a lower condition) than young owls. Analyses of fat scores and condition indices did not reveal any significant differences between the age groups. A significantly higher percentage of adult owls was recaptured than young owls. Additionally, minimum stopover was longer for adult owls at 5.6 days than for young owls at 3.5 days. Both adult and young owls lost mass between captures, although this was only significant among adult owls, and the difference between the age groups was not significant. Our results indicate that there are substantial differences in some aspects of migration and stopover ecology between age groups, but reasons for these differences are unclear.

P14. EARLY BIRD: A COLLABORATIVE PROJECT TO RESOLVE THE DEEP NODES OF AVIAN PHYLOGENY. M.J. Braun*, C.J. Huddleston*, K.L. Han, T. Yuri, J. Hunt, and M. Krosby, National Museum of Natural History; S. Hackett, J. Harshman, R. Bowie, S. Reddy, M. Burns, E. Sackett, and R. Flynn, Field Museum of Natural History; E. Braun, R. Kimball, D. Steadman, and J. Chojnowski; University of Florida, W. Moore and K. Miglia; Wayne State University, F. Sheldon, B. Marks, and C. Witt, Louisiana State University; L. Christidis and J. Norman, Victoria Museum; R. Page, University of Glasgow; R.T. Chesser, CSIRO; and D. Swofford, Florida State University.

Early Bird is a cooperative effort among nine institutions to determine the evolutionary relationships among all major groups of birds. Project goals are to provide a robust estimate of avian relationships, and to promote phylogenetic organization and interpretation of other information about birds. To date, we have completed DNA sequences for 75 taxa and 200 are nearing completion. Our dataset contains 40,000+ characters of aligned DNA sequences (about 23,000 unaligned base pairs) from 19 different nuclear gene regions. These sequences are comprised of 60% introns, 35% exons, and 5% untranslated regions, which vary in evolutionary rates by 6.5-fold. Early analyses show strong support for several expected relationships, such as placement of Paleognaths and Galloanserae at the base of the tree, along with a number of previously unsuspected relationships. Numerous insertion or deletion characters map unambiguously to various nodes in the tree yielding additional support for hypothesized relationships.

P15. RELATION OF SEASON, CLUTCH SIZE, AND EGG ORDER TO HATCHING FAILURE IN HOUSE WRENS. Douglas W. White* and E. Dale Kennedy, Biology Department, Albion College, Albion, MI 49224.

Embryos exposed to suboptimal temperatures before incubation may develop abnormally. In warm weather, hatching failure could limit clutch size. To test this idea, we predicted that hatching failure would be higher for late season clutches, large clutches, and initial eggs in 467 breeding attempts by House Wrens (*Troglodytes aedon*) we monitored in New Jersey, Kansas, and Michigan between 1983 and 2004. Eggs were marked as laid and visited daily. Manipulated or depredated clutches are excluded. Wrens were double brooded and laid 2-8 eggs per clutch. Early clutches were bigger than late clutches (6.5 ± 0.9 vs. 5.6 ± 1.0 eggs; $n=204, 263$), initiated 40 days earlier (May 20 vs. June 30), and hatched more asynchronously (2.0 vs. 2.4 hatching days). Early and late periods were similar in percentage of clutches in which at least one egg failed to hatch (26.0 vs. 26.6%) and of eggs failing to hatch (both 6.7%). Mean percentage of unhatched eggs per clutch did not differ significantly between early and late seasons (5.8 vs. 6.5%) or between seasonally defined big and small clutches (5.8 vs. 6.5%). Hatching failure varied only modestly with egg order: 8.0% of eggs one and two failed, 4.6% of middle eggs failed, and 6.3% of the two last eggs failed. Overall, the egg viability hypothesis failed to explain hatching failure in House Wrens.

P16. LOCALS AND "FOREIGNERS": SORTING OUT RELATIONSHIPS BETWEEN RESIDENT AND IRRUPTION CHICKADEES CLOSE TO A HYBRID CONTACT ZONE. Amanda Cottone, Andrew McGann, Amanda Nicodemus, Samantha Slattery, Steve Van Pelt, Nick Weber, and Robert L. Curry, Department of Biology, Villanova University, Villanova, PA 19085.

Black-capped and Carolina Chickadees are difficult to distinguish in the field, yet doing so is important for study of hybridization between these species. In winter 2004, we capitalized on irruption of Black-capped Chickadees at a Pennsylvania site roughly 30 km south of the contact zone to practice application of several methods relating to ongoing field study within the contact zone itself. We captured all chickadees at two feeding stations for color-banding and measurement. Using multivariate statistics, we were able to categorize all birds unambiguously as Black-capped or Carolina; overall size and relative tail length were the most important parameters. We confirmed the species identity of the same birds using restriction fragment analysis of mtDNA. "Chick-a-dee" calls of the two categories of birds were quantitatively distinguishable. Genetic methods allowed us to determine the sex of each chickadee. We examined dominance relationships through field observation at feeding stations. Visiting Black-capped Chickadees ranked higher than some resident Carolinas, but lower than others. All Black-capped Chickadees left the site in mid-March, as we expected. Our results are consistent with other recent evidence suggesting that Carolina Chickadees may be to some extent socially dominant over Black-caps, which may help explain recent northward movement of the contact zone between these species. [CANCELLED]

P17. NORTH AMERICAN BREEDING BIRD ATLAS VIEWER. Mark Wimer*, Bruce Peterjohn, Anna Ott, and Naoko Griffin, USGS Patuxent Wildlife Research Center, Laurel, MD 20708.

The North American BBA Viewer allows searching and display of data from multiple Breeding Bird Atlases (BBAs). The BBA Viewer is part of a group of tools integrating maintenance and display of BBA results, from data entry to coordinator review to display of final maps. Currently we have compiled results from 16 completed atlases and manage 5 in-progress atlases at the state or provincial level. Besides helping individual atlases manage their

projects and compare data between 1st and 2nd round atlases (see poster by Ellison, this meeting), the BBA Viewer has the potential to contribute to regional bird conservation. For example, combining states can provide distributional information grouped into Bird Conservation Regions or PIF physiographic regions. We are seeking results from additional atlas projects, but place higher priority on obtaining published data for states that will fill in eastern continental distribution maps such as that of the Kentucky Warbler shown here.

P18. THE VEERY CALL REPERTOIRE: CALLS USED IN SHORT- AND LONG-DISTANCE COMMUNICATION IN A MIGRATORY OSCINE PASSERINE. Christopher M. Heckscher, Department of Entomology and Wildlife Ecology, University of Delaware, Newark, Delaware.

The five North American *Catharus* thrushes are known for their complex song structures. However, all five species use an impressive call repertoire that has been largely overlooked by ornithologists. The Veery (*C. fuscescens*) is a territorial socially monogamous oscine passerine that uses calls to engage in both short-distance and long-distance (>0.5 km) communication. In 2002, I initiated a field study of individually marked birds to investigate the use of calls in Veery social interaction. Here, I report the results of my initial objective: to identify the call structures that comprise the species' call repertoire. Based on their structure, most calls fit well into two separate continuums of similar calls that appear to represent gradations within a restricted frequency range (1.0–3.9 kHz). Some of these call structures were previously thought to represent discrete call types each with a different meaning. However, the use of continuums may enable the expression of differing levels of internal motivational states. Three call structures that do not fit into either continuum are also presented. Hypotheses are currently being tested to elucidate the function of calls in both short-distance and long-distance communication.

P19. *USING AURAL SURVEYS AND RADIO-TELEMETRY TO DETERMINE THE ABUNDANCE AND HABITAT USE OF FOREST-FALCONS IN LOWLAND AMAZONIAN RAINFOREST OF SOUTHEAST PERU. Ursula Valdez, Dept. of Biology, University of Washington Box 351800, Seattle WA 98195.

Forest-falcons (*Micrastur*: Falconidae) are a group of secretive and little known Neotropical raptors. Aside from a study on the breeding and feeding ecology of Barred Forest-falcon (*M. ruficollis*) and Collared Forest-falcon (*M. semitorquatus*) in Central America, the natural history and ecology of other forest-falcons species are mostly unknown. My research aims to determine the abundance and habitat use of *Micrastur* species that coexist in lowland rainforest of southeastern Peru. In 2004, I conducted aural surveys of forest-falcons at Los Amigos Research Station, and determined the location of their potential territories. With the purpose of using radio-telemetry to monitor species habitat use, I attempted to capture *Micrastur*, using Balchatris, mistnets, and canopy nets. In addition, I recorded intra and interspecific vocal interactions, as well as mating behaviors, which helped to monitor potential breeding territories and nests. I confirmed the presence of 5 *Micrastur* species in the area, and found differences in species abundance (*M. ruficollis*, *M. gilvicollis* and *M. semitorquatus* were the most abundant, and *M. buckleyi* and *M. mirandollei* the least abundant). I documented a total of 17 territories for all the species of forest-falcons in the area. I found a nest of *M. buckleyi*, which is the first nesting record for this species across its entire distributional range, and I collected data on eggs and chicks development. Individuals of *M. semitorquatus* and *M. buckleyi* were fitted with backpack radio-transmitters, and their movements are currently monitored in the study area.

P20. *EFFECTS OF WEST NILE VIRUS INFECTION ON THE NEST DEFENSE BEHAVIOR OF EASTERN BLUEBIRDS (*SIALIA SIALIS*). Kayde Gilbert*, Janet Gorrell, and Gary Ritchison, Department of Biological Sciences, Eastern Kentucky University, Richmond, KY 40475.

West Nile Virus (WNV) was introduced to New York in 1999 and since then has spread throughout the United States. Birds act as natural hosts of the virus and their migratory habits have likely contributed to this rapid spread. In birds that develop antibodies against the virus, little is known of behavioral changes induced by the stress of viral infection. This study examined the effects of WNV infection on nest defense behavior of Eastern Bluebirds (*Sialia sialis*) in central Kentucky during the 2003 and 2004 breeding seasons. Adult bluebird pairs were presented with a live Eastern Screech-Owl (*Otus asio*) and nest defense behaviors were quantified. In addition, bluebirds were caught and a blood sample was collected and tested for WNV infection. Infected and non-infected males exhibited similar defense behaviors. Infected males responded more aggressively than non-infected males but the difference was not significant. That both infected and non-infected birds behaved similarly suggests that WNV infection may not affect a bird's physical condition to the point that behavioral differences occur in this species. However, infected birds may be willing to take greater risks and invest more in current broods because their reproductive value, in terms of future broods, is reduced.

P21. *THE EFFECTS OF HUMAN AND ENVIRONMENTAL STRESSORS ON WHITE-CROWNED SPARROW CORTICOSTERONE LEVELS AND REPRODUCTIVE SUCCESS. Matthew S. Dietz, School of Natural Resources & Environment, University of Michigan, Ann Arbor, MI 48109.

As human population and concomitant development increase, human-caused disturbance stimuli play an ever larger role in the fitness of wildlife. An increasing number of studies have implicated anthropogenic disturbance in having harmful effects on birds and other wildlife. The most immediate effects are most often shown as behavioral changes, including fleeing, change in feeding habits, and shifts in habitat use. Few studies have investigated physiological changes such as increased heart rate, respiration, or hormone production. Moreover, only a minority of studies show a clear link between the disturbance and reproductive success. I am investigating the effects of road traffic and pedestrian disturbance on White-crowned Sparrows at the Rocky Mountain Biological Lab in Gothic, Colorado. Through nest location and monitoring and stress series protocols, I am researching the relationship between disturbance, corticosterone levels (a stress hormone), and reproductive success. I also investigate how these measures interact with food supplementation. This research will help managers to quantify the effects of human disturbance and to predict the impacts of land-management decisions.

P22. IDENTIFYING STOPOVER SITES FOR MIGRATING PASSERINE BIRDS IN THE LOWER CHESAPEAKE BAY REGION. Sarah Mabey, Department of Zoology, North Carolina State University, Raleigh, NC 27612, Bryan Watts, Bart Paxton, Fletcher Smith, Center for Conservation Biology, College of William and Mary, Williamsburg, VA 23187, Barry Truitt, The Nature Conservancy, Virginia Coast Reserve Program, Nassawadox, VA 23413, and Deanna Dawson*, USGS Patuxent Wildlife Research Center, Laurel, MD 20708.

Stopover sites in the Lower Chesapeake Bay region, used in autumn by passerine birds that migrate nocturnally, are being identified from radar images (WSR-88D/NEXRAD, Wakefield, VA, and NPOL, a higher resolution radar installed at Oyster, VA). Radar images from the hour after sunset “capture” birds as they leave stopover sites to resume their migration. Exit locations (exodus signatures) are being mapped, and then summed across the season to identify sites that receive high or consistent use. Field surveys on the Lower Delmarva Peninsula provide independent estimates of the spatial and temporal distribution of migrants, ground-truthing the radar results. Vegetation characteristics of available habitats were sampled, and the relationship of migrant distribution and abundance with habitat and landscape characteristics will be modeled. Project results will aid in the evaluation of radar as a tool for identifying important stopover sites and tracking bird migration patterns, and provide direct input to habitat conservation programs.

P23. *NEST DEFENSE BEHAVIOR OF MALE AND FEMALE EASTERN BLUEBIRDS. Jacqueline Bennett* and Gary Ritchison, Department of Biological Sciences, Eastern Kentucky University, Richmond, KY 40475.

Defense of young may be one of the mostly costly forms of parental investment because defending individuals risk injury or even death. Several factors may influence the intensity of defense by parents, including their sex, brood size, predator type, and, for multibrooded species, brood number. We examined the possible effects of these factors on the nest defense behavior of Eastern Bluebirds (*Sialia sialis*) in Kentucky. From May - August 2004, we conducted 61 trials during which a predator, a live Eastern Screech-Owl (*Otus asio*) or a model Black rat snake (*Elaphe obsoleta*), was placed near nest boxes containing 13 - 16 day old nestlings. Analysis revealed no difference in the responses of males and females. However, adults with larger broods responded more aggressively (closer approach distances and more vocalizations) than those with smaller broods. Adults also defended first and second nests more aggressively (closer approach and more vocalizations and flights) than third nests, and responded more aggressively (more flights and vocalizations) to the owl than the snake. These data suggest that larger broods and early broods are of greater reproductive value than smaller and later broods. Later broods may be less valuable because these young have less time and, therefore, may be less likely to acquire the skills needed to survive the coming winter. Bluebirds apparently perceived the owl as a greater threat than the snake model, perhaps because the movements of the live owl provided a stronger stimulus or the owl represented a threat, not just to nestlings, but to the adults as well.

P24. TRILL RATE AS A PERFORMANCE MEASURE IN GRASSHOPPER SPARROW SONG. Stephanie E. Little*, Katherine E. Eggleston, Kristin Hnilicka, Bernard Lohr, and Douglas E. Gill, Department of Biology, University of Maryland, College Park, MD 20742.

When the frequency bandwidth of a trilled emberizid song is plotted against trill rate, a maximum upper boundary to song performance is evident. This boundary has been proposed as a motor constraint to song production in the Emberizidae, and proximity to this boundary as a measure of relative vocal motor performance ability. We recorded grasshopper sparrow songs on a 230-acre experimental grassland at the Chester River Field Research Center near Chestertown, MD. We measured bandwidth as a function of trill rate in the rapidly amplitude modulated portion of grasshopper sparrow territorial song (Type I or “buzz” song). Grasshopper sparrows produced

trill rates between 60–120 per second—at or beyond the rates measured for other emberizids given their frequency bandwidth. Variation in trill rate within grasshopper sparrows, however, did not correlate with any measure of size or condition.

P25. FORAGING ECOLOGY OF MIGRATORY AND RESIDENT BIRDS IN COFFEE AGROECOSYSTEMS OF CHIAPAS, MEXICO. Thomas Dietsch*, Russell Greenberg, and Peter Bichier, Smithsonian Migratory Bird Center, National Zoological Park, Washington, DC, 20008; Ivette Perfecto, University of Michigan, School of Natural Resources & Environment, Ann Arbor, MI, 48109; and Suzanne Langridge, Environmental Studies, University of California, Santa Cruz, CA, 95064.

Despite increased attention, many questions remain about the ecology of migratory birds on their wintering grounds. Migratory birds are frequently characterized as generalists taking advantage of resources unexploited by residents. However, migratory birds can numerically swamp resident bird populations, accounting for 30-50% of the total birds present. This suggests more complex interactions between migratory and resident birds. This study used foraging and stomach content data to test for differences in resource use between migratory and resident birds in two coffee agroecosystems of different management intensities in Chiapas, Mexico. There was no difference in arthropod prey size, but migrants and residents consumed different proportions of available arthropod orders. There is some evidence that residents shift their foraging behavior in response to the presence of migrants. Migrants and residents did not select different tree species to forage, but they did use different parts of the tree. Overall, there was no difference in relative foraging heights between migrants and residents, but foraging height varied by management system. Greater diversity of shade trees may provide more resources in winter facilitating coexistence between migrants and residents.

P26. *MALE DOMINANCE RANK IN AN EXPANDING HYBRID ZONE BETWEEN BLACK-CAPPED CHICKADEES (*POECILE ATRICAPILLUS*) AND CAROLINA CHICKADEES (*P. CAROLINENSIS*) IN SOUTHEASTERN PENNSYLVANIA. Lindsay Zemba* and Robert Curry, Department of Biology, Villanova University, Villanova, PA 19085.

Black-capped chickadees (BC) and Carolina chickadees (CA) hybridize extensively along a narrow, parapatric contact zone. Chickadees are monogamous, territorial songbirds that spend the winter in small flocks in which the dominance relationships are well established. In regions with only one species present, females prefer social partners with high dominance status, which they appear to assess directly from behavior and indirectly from plumage brightness. At Hawk Mountain Sanctuary (HMS), Kempton, PA most chickadees are BC; however, the hybrid zone is moving northward such that hybrids or CA-like chickadees are now present. I will study dominance, plumage, and mating consequences at HMS in 2005 and 2006. I predict that CA-like males at HMS will be dominant over BC males. In January through March 2005 I assessed dominance hierarchies by recording pairwise dominance interactions between birds at winter feeding stations. I observed 647 dyadic interactions between birds in 5 flocks. Each bird was assigned a nominal rank class: high, mid, or low, in addition to a continuous rank score, which was calculated by taking the total number of interactions won divided by the total number of interactions. Specific questions I will address include: (1) does plumage brightness vary with genotype? (2) is dominance predicted by plumage brightness? (3) is dominance a function of genetic identity? and (4) are social pairings a function of dominance? This study provides a unique opportunity to investigate the mechanisms of hybrid zones at the edge of the range expansion.

P27. GULL HARASSMENT AND PREDATION ON ADULT BLACK-CROWNED NIGHT HERONS IN THE NEW YORK CITY AREA. Andrew J. Bernick, Department of Biology, City University of New York-Graduate Center/College of Staten Island, 2800 Victory Blvd., Staten Island, NY 10314.

Over 1,500 pairs of colonial wading birds (e.g. herons, egrets, and ibis) nest on islands in NY/NJ Harbor with other species of waterbirds (e.g. gulls and cormorants). During shore-based observations of a multispecies colony on Hoffman Island in lower NY Harbor (2001-2004), I observed numerous aggressive encounters between gulls nesting on the perimeter of the island and wading bird adults flying to and from the colony on foraging flights. On several occasions, these encounters were lethal: groups of Great Black-backed gulls mobbed individual adult wading birds, drove them to the surface of the harbor near the colony, and consumed both the regurgitant and the bird itself. While seven species of wading birds nesting in this colony were chased by gulls during foraging flights, the species most often captured and killed were Black-crowned Night Herons (N=5). Within colonies of this type, evidence of intraspecific and interspecific predation on wading bird eggs and nestlings has been established, while predation on adult wading birds by gull species has not previously been recorded.

P28. CATASTROPHIC EFFECTS FROM RACCOON PRESENCE IN GULL BREEDING COLONIES. Myra Shulman, Julie Ellis, Holly Jessop*, Virginia Seng, and Katie Mach, Ecology & Evolutionary Biology, Cornell University, Ithaca, NY 14853-2701.

The Isles of Shoals, a nine island archipelago in the Gulf of Maine, is home to some of the largest gull colonies in New England and also provides important habitat for other nesting seabirds. In 2004, colonies of Great Black-backed (*Larus marinus*) and Herring (*Larus argentatus*) gulls on two of the islands suffered nearly complete breeding failure. We documented extensive egg and chick mortality on these islands, and quantified the extremely low breeding success (0.01 chicks/nest). In contrast, surveys of gull colonies on two additional islands indicated normal breeding success (0.78 chicks/nest). We assumed that chick mortality resulting from potential adverse weather conditions, exposure to pollutants, reduced food resources, and/or disease prevalence, would be similar across all islands. Instead, we suspected the presence of recently introduced raccoons (*Procyon lotor*) on the islands where chick survivorship was low. A trapping campaign confirmed the presence of at least eleven raccoons on the islands with low breeding success. Given additional observations of gull behavior and raccoon scat in the colonies, we believe that these predators were the instigating cause of high egg and chick mortality. That so few raccoon predators might result in breeding failure in large colonies (> 2000 pairs) of Great Black-backed and Herring gulls has not previously been reported. We discuss a number of possible mechanisms by which a few raccoons might cause such catastrophic effects in so large a colony. An understanding of these predator-prey dynamics, and the potential magnitude of their consequences, is important for future management of nesting seabirds and their breeding habitat.

P29. SEX MANIPULATION WITHIN BROODS OF HOUSE WRENS? A REPEAT STUDY. L. Scott Johnson*, Brian S. Masters, Larry E. Wimmers, Bonnie G. Johnson, Robyn Milkie, Rachel Molinaro, & Brendan Gallagher, Dept. of Biology, Towson University, Towson MD 21252.

Most reports of adaptive manipulation of offspring sex have come from single-year studies with small sample sizes. Repeat, multiple-year studies are needed to confirm positive results. Albrecht (2000; *Animal Behaviour* 59: 1227) asked whether embryos from last-laid eggs in clutches of the House Wren (*Troglodytes aedon*) were predominantly female. Last-laid eggs typically hatch 36-48 h after most other eggs. This puts offspring from last eggs at a competitive disadvantage and these offspring are often in poor physical condition at fledging. Being in poor condition may negatively impact male fitness more than female fitness because males compete intensively for limited nest sites. Albrecht found a strong female bias among offspring from last-laid eggs (27 of 34 individuals) in 1997 in a Wyoming population. We repeated Albrecht's study over three seasons, 2002-2004, using the same population. We found no sex bias among offspring from last-laid eggs in any year (overall, 48.8% of 86 individuals were female). We also found no sex bias among offspring from second-to-last eggs (which also hatch late) or among offspring from the first two eggs. Why our findings differ from Albrecht's is unclear. Regardless, whether (or when) House Wrens adaptively manipulate the sex of offspring within broods must again be considered an open question.

P30. EGG AND CLUTCH SIZE VARIATION ALONG AN ELEVATIONAL GRADIENT IN MOUNTAIN BLUEBIRDS. Emilene Ostlind*, L. Scott Johnson, and Susan L. Balenger, Dept. of Biology, Towson University, Towson MD 21252.

In montane regions, some species of birds breed along extensive elevational gradients. Few studies have asked how life history traits vary within populations as elevation increases, conditions become persistently colder and windier, and breeding seasons shorten. Selection may favor laying larger eggs at higher elevations because larger eggs, and the larger hatchlings that they produce, lose heat less rapidly. Large eggs can also contain proportionately more water to compensate for more rapid diffusion of water out of eggs at lower barometric pressures. One might predict clutch sizes to be smaller at high elevations in response to greater energetic demands on parents. Alternatively, selection may favor production of large broods at high sites for thermoregulatory benefits that result from shared body heat and mutual insulation. We compared eggs and clutch sizes of Mountain Bluebirds (*Sialia currucoides*) breeding at ~1300 and ~2500 m in Wyoming's Bighorn Mountains in 2004. After adjusting for a seasonal increase in egg size at both sites, we found that eggs at our high site were insignificantly smaller than those at the low site by 61 mm³ or 2.7% ($P > 0.35$). After adjusting for a seasonal decline in clutch size at both sites, clutches tended to be smaller at the high site by ~0.3 eggs or 6% ($P = 0.075$).

P31. NEW YORK'S SECOND BREEDING BIRD ATLAS. Kimberley Corwin*, NYS Department of Environmental Conservation, 625 Broadway, Albany NY 12233-4754, and Kevin J. McGowan, Cornell Laboratory of Ornithology, 159 Sapsucker Woods Road, Ithaca, NY 14850.

New York State is the first in North America to complete a traditional, full-coverage Breeding Bird Atlas project. Five years of field work (2000-04) have resulted in a database with more than 370,000 records. Updated

distribution maps for more than 250 species can be compared to those generated from the state's first Atlas project (1980-85). Statewide or regional expansions are apparent in the distribution of some species (e.g., Red-bellied Woodpecker) while contractions are seen in others (e.g., Whip-poor-will). Several new species have been added to the breeding avifauna of the state (Merlin) and a few reported in the first Atlas have not yet been documented in the current Atlas. The new Atlas publication, which will be available in 2007, will include a current distribution map and a map indicating change for each species and discussion of the changes on a broad and localized scale. New, original artwork will illustrate the publication.

P32. *USING SONG PLAYBACKS TO INFLUENCE BREEDING HABITAT SELECTION BY AMERICAN REDSTARTS. Beth A. Hahn, School of Natural Resources & Environment, University of Michigan, Ann Arbor, MI 48109.

Declines in the abundance of Neotropical migratory songbirds are a serious conservation concern. For many species, loss of North American breeding habitat is believed to be a key factor underlying these declines. To breed successfully on their return to northern forests in the spring, songbirds must quickly identify and establish suitable territories. Understanding how individuals select breeding habitat is therefore critically important to the conservation and management of songbirds. Using song playback experiments in the Hiawatha National Forest of Michigan's Upper Peninsula, my project examines the extent to which American Redstarts (*Setophaga ruticilla*) use the presence and density of conspecific individuals to measure habitat quality when selecting breeding territories. Preliminary results show that territory selection is positively affected by the presence of singing males. Playbacks increased the number of territory occupants at both high and low population densities. The development of methods for attracting songbirds to targeted forest stands with suitable habitat would complement existing management approaches and enhance species conservation through maintenance, recruitment, and restoration of breeding populations.

P33. POSSIBLE DISTRIBUTIONAL CHANGES DETECTED BY A SECOND BREEDING BIRD ATLAS IN MARYLAND AND THE DISTRICT OF COLUMBIA. Walter G. Ellison*, Maryland Ornithological Society, 23460 Clarissa Rd, Chestertown, MD 21620 and Mark Wimer, USGS Patuxent Wildlife Research Center, Laurel, MD 20708.

First-run breeding bird atlases establish a baseline for detailed avian range maps. However, a single atlas provides no information on changes in distributional status over time. Maryland and D.C. have undertaken a second atlas to document two decades of change since the 1987 completion of the first MD/DC atlas. This project started in 2002 and is now entering its fourth and penultimate field season. Thus far, data has been collected in 1109 five km² atlas blocks with 204 species reported, 175 of them confirmed as breeders. Several grassland and mature forest Neotropical migrant birds appear to have seen some range shrinkage over the last two decades. Here we present several examples of distributional change detected between the two MD/DC atlas projects and discuss what still needs to be achieved over the last two years of the current project.

P34. LOCATING AND PROTECTING PURPLE MARTIN ROOSTS. Patrick J. Kramer*, and James R. Hill III, Purple Martin Conservation Association, Edinboro University of Pennsylvania, Edinboro, PA 16444.

After nesting and prior to migrating, Purple Martins (*Progne subis*) form large communal roosts, typically in association with larger water bodies. The roosts may form in natural vegetation or on man-made structures such as bridges. In the latter case, conflicts between the birds and people can arise, requiring remedial measures. The Purple Martin Conservation Association (PMCA) is developing a program to locate, catalog and, in necessary cases, seek protection for Purple Martin roosts. Roosts will be located using WSR-88D Doppler radar imagery and reports solicited from citizens. Roosts will be cataloged in an interactive database that will enable individual citizens or groups to report new roosts, confirm suspected roosts, monitor known roosts, and report issues or problems associated with the roosts. In cases where Purple Martin roosts are in need of protection, the PMCA will work with concerned parties at the local level to develop conservation plans.

P35. HABITAT ENHANCEMENT TO IMPROVE WATERBIRD PRODUCTIVITY: WHAT IS THE BEST METHOD? Brook Lauro, Department of Computer Science, Mathematics and Science, St. John's University, Jamaica, New York 11439.

Different methods are evaluated to enhance habitat to improve waterbird productivity at Breezy Point, Gateway National Recreation Area, New York City. In the absence of a major storm to open habitat in the past ten years American Beachgrass (*Ammophila breviligulata*), through the process of succession, has become dense and is encroaching upon the oceanfront. This appears to be discouraging waterbird nesting, including threatened Piping Plovers (*Charadrius melodus*) since available nesting habitat has become limited. Moreover, waterbird species, including Piping Plovers and Common Terns (*Sterna hirundo*), are shifting nesting closer to the high tide line

creating a conflict with beach bathers. Thus, to help improve productivity and to ease interaction between birds and people a project has been proposed to enhance habitat by removing vegetation. Different methods are compared including: removal by hand, mowing, raking, use of landscape fabric, disking, bulldozing, salt application and herbicide use. These methods used either singly or in combination have advantages and disadvantages depending upon the site, as well as equipment, staff and funding available. Based upon a review of the literature and discussions with wildlife professionals, the preferred method for Breezy Point is bulldozing to remove vegetation above and below ground followed by beach raking. Reasons for this are discussed. After an initial experimental removal results will be evaluated and incorporated into a long term management plan.

P36. THE EFFECTS OF SKI SLOPE FRAGMENTATION ON AVIAN DIVERSITY AND BEHAVIOR. Andrea Kraljevic, School of Natural Resources & Environment, University of Michigan, 430 E. University Ave, Ann Arbor, MI 48109.

Habitat fragmentation is of serious concern to conservationists and managers alike. It reduces the natural habitat available to species, while also disrupting their life histories. Minimizing the effects of fragmentation is necessary to maintain a diverse community. I investigated how ski slope fragmentation affects local avian diversity through comparing species in adjacent fragmented and unfragmented mountain habitats in Crested Butte, Colorado during the summer of 2004. In addition, I recorded how bird behavior changes in response to crossing different sized ski runs. Through my results, I will suggest methods to reduce the impact to avian diversity when designing ski slopes. My study is particularly important due to the current development plans of the Mt. Crested Butte ski resort which is expanding their ski slopes onto an unfragmented mountain. My results are applicable to the development and management of any ski resort concerned with maintaining a stable biological community.

P37. COMPARISONS OF STRESS IN HOUSE FINCHES USING HETEROPHIL TO LYMPHOCYTE RATIOS. Doris J. Watt*, Danelle Duffy, Leslie Kleczek, and Shannon Meyer, Department of Biology, Saint Mary's College, Notre Dame, IN 46556.

H/L ratios of differential counts of leukocytes are being used increasingly in avian studies of stress (e.g., Dark-eyed Juncos, Leary et al. 1999; Adelie Penguins, Vleck et al., 2000; Harris' Hawks and Peregrine Falcons, Parga et al. 2001). We used H/L ratios to evaluate potentially stressful periods in male and female House Finches. We compared differential WBC counts for the sexes in January and in July. Male House Finches had higher H/L ratios in July than in January, whereas females had higher ratios in January relative to those in July. These differences were predicted based on the potentially stressful lifestyle of males during the breeding season as they defend the territory as well as feeding the incubating female and then the young after they hatch. For July males brighter plumaged birds (n=4) had lower H/L ratios than lighter plumaged birds (n=4).

P38. SEX-SPECIFIC SURVIVAL RATES OF ADULT ROSEATE TERNS: ARE MALES PAYING A HIGHER REPRODUCTIVE COST THAN FEMALES? Jeffrey A. Spendlow*, USGS Patuxent Wildlife Research Center (PWRC), Laurel, MD 20708; David A. Shealer, Department of Biology, Loras College, Dubuque, IA 52004; J.S. Hatfield and J.D. Nichols, PWRC; and I.C.T. Nisbet, I.C.T. Nisbet & Co., North Falmouth, MA 02556.

A long-term mark-recapture/resighting program has been carried out on the Roseate Terns (*Sterna dougallii*) nesting at Falkner Island, Connecticut, USA from the late 1980s through the mid 2000s, and from 1995-1998 an intensive collaborative study of food-provisioning of chicks by their parents also was conducted on many of the banded individuals at this site. Adult female Roseate Terns have significantly higher "local survival" rates than do males. While both sexes feed their young, males usually have higher prey delivery rates than do females and do most feeding of the (oldest if more than one) chick just before it fledges. Males usually depart at the same time as the (oldest) fledgling, while successful female parents may linger at the colony site for up to two weeks. The lower "local survival" rate of males probably does not represent lower colony-site fidelity, but instead may reflect the price they pay for doing more "child care", especially if fledglings are still dependant on them for food during post-breeding dispersal and (at least early) migration.

P39. BREEDING CLIMATE PREFERENCES OF THE CERULEAN WARBLER DETERMINED BY SPATIAL FILTERING OF BREEDING BIRD SURVEY DATA. Jennifer Baldy, Esra Ozdenerol, Lensyl Urbano, Hsiang-te Kung, Advanced GIS Laboratory, Department of Earth Sciences, University of Memphis, Memphis, TN 38152, and Paul Hamel*, USDA Forest Service, Center for Bottomland Hardwood Research, P.O. Box 227, Stoneville, MS 38776.

Cerulean Warbler (*Dendroica cerulea*: Parulidae) is a Nearctic-Neotropical migrant showing significant decline in population as measured by the Breeding Bird Survey. IUCN—The World Conservation Union recently listed the species as Vulnerable. In spite of the decline, populations in the northern portion of the range appear to be increasing. We test the association of Cerulean Warbler locations measured by the Breeding Bird Survey to climate

variables over the summer breeding range modeled at the continental scale for the years 1966 to 2003. Spatial filtering (Rushton and Lolonis 1997) is used to identify areas that are demographically significant using the occurrence rates (Schoener 1987) for each year of the study, to determine if and where clustering occurs. The research hypothesis is that Cerulean Warblers are dependent upon specific climate parameters and the resulting ecosystems. Calculated rates of occurrence and Monte Carlo-determined significance values for those rates are used to determine which climate parameters may be more important to the species. The intersection of clusters represents the area where Cerulean Warblers are present at a high rate persistently over time, and is used to identify climate characteristics that are favorable. The union of the clusters is used to identify differences in climate conditions preceding the survey when Cerulean Warblers are identified at a high rate versus years when they are not detected at a high rate. Initial analysis of these data suggests that temperature parameters are more important determinants of occurrence of the birds than are precipitation measures.

P40. *EVALUATING HOME RANGE ESTIMATORS FOR PASSERINES. Jason Law* and Emily Silverman, School of Natural Resources and Environment, University of Michigan, Ann Arbor, MI 48105.

Home range estimators have been used widely in avian studies where locations are obtained through direct observation. However, the properties of these estimators have not been widely studied with this type of data, nor has a standard location sampling protocol been developed. We collected locations on 18 Black-throated Blue Warblers in the Upper Peninsula of Michigan during the summer of 2004. Data from previous studies was also used to compare the results under a variety of sampling regimes. Two estimators, the minimum convex polygon and the kernel density estimator were evaluated for their performance. Kernel density estimators performed relatively better however this estimator is in general more difficult to use.

P41. OSPREY ACTIVITY ON THE POTOMAC RIVER. Marcy Heacker*, Smithsonian Institution, National Museum of Natural History, Division of Birds, Washington, D.C. 20560 and Joe Witt, U.S. Fish & Wildlife Service, Potomac River National Wildlife Refuge Complex, Woodbridge, VA 22191.

The Osprey (*Pandion haliaetus*) is a cosmopolitan bird of prey that is common in the Chesapeake Bay region. This study presents general observations of Osprey reproductive activity along a portion of the Potomac River south of Washington, DC from 2002-2004. The survey area covers approximately 160 km of shoreline from Sheridan Point, VA and Piscataway Creek, MD to Cockpit Point, VA and Mattawoman Creek, MD. An average of 58 active nests were observed per year. All observations were made during morning surveys from a boat traveling approximately 100 m from the shoreline. Reproductive productivity and mapping of nest density are presented with comments on the impact of human activity on nest success. Additionally, notes on individual counts, nest structure preference, and interspecies interactions are presented. While Osprey populations in this study seem stable, persistent local surveys and observations are important to assess regional trends, monitor potential shifts in biological success, and reflect any progressive impacts of human factors.

P42. *A PRELIMINARY ANALYSIS OF FEATHER MICROBIAL COMMUNITIES ON NEW WORLD PASSERINES. Anne C. Logie*, Department of Biological Sciences, University of Maryland Baltimore County, Baltimore, MD 21250; Isabelle A. Bisson and Peter P. Marra, Avian Ecology, Smithsonian Environmental Research Center, Edgewater, MD 21037-0028; Patrick M. Gillevet, Department of Environmental Sciences and Public Policy, George Mason University, Manassas, VA 20110; and Edward H. Burt Jr., Department of Zoology, Ohio Wesleyan University, Delaware, OH 43015. Feather samples were collected from birds captured in Patuxent River Park, Maryland in May and June 2004. Breast, head, tail and dorsal feathers were extracted and examined for diversity and abundance of feather microbial communities. The 16s rRNA gene was PCR-amplified using a labeled forward primer and unlabeled reverse primer for subsequent Amplicon Length Heterogeneity fingerprinting analyses. ALH fingerprinting was used to assay the diversity and abundance of feather microbial communities. Data collected suggested microbial communities present on individuals within a species did not vary significantly. Tail, head, breast, and dorsal feathers had similar microbial communities. Microbes with an amplicon length of 336.24 base pairs were most common and abundant but not present in redstarts. Microbial communities differed between redstarts and other bird species assayed. The results collected provide preliminary information that will further be examined on passerine wintering grounds. This could provide a way of identifying the migratory path taken by specific passerines during winter migration.

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