

Student and Young Professionals' Symposia:

The **Undergraduate Symposium** will highlight work being done by undergraduate student ornithologists. It will take place on Thursday Afternoon.

The **Early-Professionals Mini-talk Symposium and Q&A Session** will feature early career ornithologists. It will take place in a special session on Wednesday at 5:30PM.

Topical Symposia:

A bright future for birds: understanding the impacts of light pollution on avian wildlife

Organizers: Meredith E. Kernbach (University of South Florida), Clint Francis (California Polytechnic State University), Lynn B. Martin (University of South Florida)

Morning – Thursday

Light pollution, or the presence of unnatural levels of light at night, is one of the most widespread and rapidly increasing anthropogenic stressors. Although a small proportion of avian diversity is represented in urban habitats, many suburban or rural residing species are also at risk via agricultural facility lighting, polluted migratory passages, lighted greenspaces near roadways and airports, illumination of shorelines, and other sources. As the majority of organisms on earth evolved in the absence of such intense nighttime illumination, light pollution poses a novel and spatiotemporally extensive threat to birds.

Foundational research revealed that exposure to light pollution often leads to arrhythmia in the suprachiasmatic nuclei (SCN), the part of the brain responsible for integrating light signals and synchronizing melatonin secretion. Furthermore, light pollution can dysregulate corticosterone and testosterone in several species of birds. There is a clear need to understand how these physiological effects translate into ecological, evolutionary, and conservation impacts.

Many aspects of avian life histories are impacted by light pollution. For instance, birds that reproduce seasonally advance the timing of gonadal development and courtship behavior by nearly a month. These changes occur because light at night is mistaken for extensions of daylength, which many species use to time seasonal cycles. Nocturnally migrating birds can also be distracted or “entrapped” in nighttime lighting en route to breeding or wintering grounds. One striking example is the attraction of passerines to the bright projections of the 9/11 memorial in New York City.

At the community level, light pollution can alter interactions among species. Light can alter competition, which can force some species to shift daily activity into nighttime periods. Predation risk can also increase for some species, and for nocturnal predatory species foraging prospects can improve or deteriorate depending on favored food sources (e.g., some insects are concentrated by light pollution, but small mammals likely avoid it).

These above examples illustrate how the effects of light pollution might span molecular to community scales, but data are just beginning to accrue. Therefore, several levels of analysis are needed to understand and come up with solutions to mitigate the impacts of light pollution.

Assessing the Cumulative Effects of Resource Development on Migratory Birds in Northern Boreal Regions

Organizers: C. Lisa Mahon (Canadian Wildlife Service, Environment and Climate Change Canada, University of Alberta)

Morning – Wednesday

Human activity has altered much of the North American landscape in the last two centuries, resulting in considerable shifts in species composition. Until recently, western boreal forests have remained largely undeveloped with the exception of agriculture at the southern edge. However, over the past two decades, simultaneous development by multiple resource industries has intensified within this region (forestry, bitumen/oil sands extraction, conventional oil and gas extraction, mineral mining, and peat mining). This pattern of development is intensive at local scales (e.g. open pit mines) and extensive at landscape and regional scales (e.g. seismic lines). Understanding and mitigating the effects of multiple stressors requires approaches that examine the combined or cumulative effect of multiple stressors and sectors on ecosystem components like migratory landbirds [i.e. cumulative effect assessment (CEA)]. This symposium will introduce the topic of regional or effects-based CEA and use case studies from the western boreal to demonstrate approaches and tools used to assess the effects of multiple stressors on migratory birds. The first symposium will introduce the topic of CEA including: (1) an overview of the four general categories of analytical approaches to CEA and an assessment of their ability to meet many of the stated objectives of CEA for migratory birds; (2) a framework for using an empirical species-stressor modeling approach; and (3) the use of landscape simulation modeling within CEA. The second symposium will highlight the use of an empirical species-stressor modeling approach using an additive modeling framework to identify key stressors and sectors. The third symposium will highlight the use of an empirical species-stressor modeling approach using a paired additive-interactive modeling framework to identify whether the effects of multiple stressors are additive or interactive and to assess the effect size and interaction type (synergistic or antagonistic) of interactive effects. The fourth symposium will use community metrics to assess how cumulative effects combine to affect the bird community as a whole. The fifth symposium will use the forest landscape model LANDIS-II to simulate the impacts of climate change and forest harvesting on boreal bird communities.

Avian biology and the annual life cycle: shorebirds as models to understand dynamic boundaries

Organizers: Kirsty E. Gurney (Environment & Climate Change Canada), Dan R. Ruthrauff (United States Geological Survey)

Afternoon - Wednesday

Throughout their annual life cycles, migratory birds use multiple habitats that can be distributed across broad spatial scales and encompass a diverse range of environmental conditions. Increasingly, evidence is showing that these conditions, as experienced during one stage of the annual cycle, can influence the health and / or survival of individuals in subsequent stages. Difficulties in tracking migratory birds over the annual cycle and lack of information on migratory connectivity, however, make it challenging to detect and understand these interactions (i.e. carry-over effects). These remain critical needs for

informed conservation planning, given the potential influence of carry-over effects on population dynamics through changes in demographic rates.

For shorebirds (Charadriiformes), the need for information on migratory connectivity and tests for possible carry-over effects are particularly pressing. Current evidence suggests that populations of many shorebird species are declining, and the status of several species that nest in North America have been designated as of “conservation concern” by the US Shorebird Conservation Partnership: of 57 taxa (species / subspecies) evaluated by this group, seven taxa are listed under the Endangered Species Act, and an additional nine North American populations meet Watch List criteria (i.e. greatest or high conservation concern). Whereas habitat loss and degradation are likely affecting shorebird populations on wintering grounds, changes in breeding and migratory habitats, food resources, and predation risk may also have an important influence. Given the long-distance migrations and dynamic boundaries of many North American shorebird species and their strong potential for carry-over effects across different phases of the annual life cycle, this taxa exemplifies the concept of ‘birds on the edge’.

The objectives of this session will be to assemble speakers who (i) will describe research that uses a life-cycle approach to study the biology and migratory connectivity of shorebirds, and (ii) will discuss the methods that are currently available for tracking shorebirds throughout their annual life cycles, including key assumptions and limitations of the technology. We anticipate that presentations will encourage an ongoing dialogue of the challenges and future directions for the study of migratory connectivity and carry-over effects in shorebirds and other species.

Biodiversity mediated trade-offs in agroecosystems: When do birds help or hurt farmers?

Organizers: Liba Pejchar (Colorado State University), Christina M. Kennedy (The Nature Conservancy)

Afternoon - Wednesday

Agriculture is the primary driver of land use change, yet farms and ranches in turn are critical for food security and can play a vital role in protecting biodiversity. In agroecosystems, birds provide services to producers and society (e.g., pest control, pollination), but can also be agents of disservices (e.g., pathogen transmission, crop damage). The circumstances under which bird communities provide net benefits to farmers, however, remain poorly understood. Can we predict the net effects of bird activity based on species traits, crop type, farm-scale practices, and/or landscape context and configuration? If so, how do we design farms and landscapes that capitalize on bird-mediated ecosystem services to produce positive ecological, economic and social outcomes for birds, farmers and society? What current and emerging tools for policy and practice could foster positive outcomes? This session will explore these challenges and opportunities through ten lively presentations. Our speakers, all of whom have confirmed participation, will share novel research on birds in diverse agroecosystems globally. Collectively, these talks will provide new insight on where and when birds help farmers and farmers help birds, catalyzing discussion of creative ways to advance ecological understanding of bird-mediated services/disservices. Ultimately, these biological insights, in collaboration with the work of economists and other social scientists, will be necessary to achieve co-benefits for conservation and human well-being across the large proportion of earth’s terrestrial ecosystems devoted to food production.

Birds with benefits: evidence and trade-offs of multiple-benefit conservation focused on birds

Organizers: Thomas Gardali (Point Blue Conservation Science), Kristen Dybala (Point Blue Conservation Science), Nathaniel Seavy (Point Blue Conservation Science)

Morning – Friday

Conservation continues to be a relatively low social and political priority globally, with precedence given to economic development and, understandably, to basic human health needs. Hence, despite some notable successes, the global loss and degradation of biomes continues at an alarming pace and numbers of at-risk birds continues to grow. While ornithologists have long pointed to birds being excellent indicators of environmental quality, and while conservationists have long espoused the importance of biodiversity and ecosystem functions for human well-being, the multiple benefits of avian conservation to people have not been clearly articulated. The concept of multiple-benefit conservation, a variation on the ecosystem services concept, has been gaining momentum. Multiple-benefit conservation can be defined as projects designed to meet societal needs, enhance ecological function and improve habitat quality for fish and wildlife. Multi-benefit projects can provide benefits such as groundwater recharge, improved air and water quality, and access to recreation. Multiple-benefit conservation has the advantages of being relatively easily understood and communicated, includes ecosystem services without using that term or necessarily including only things that can be monetized, and appeals to the human desire to have our cake and eat it too. That conservation measures focused on birds would also confer other benefits seems obvious, yet there is little empirical evidence that this is the case, and these co-benefits are rarely measured directly. At the same time, conservation measures focused on birds could also result in a reduction, and hence a trade-off, to other project goals or societal values, but these are also rarely measured directly. As a result, there are relatively few examples where bird conservation efforts formally incorporate co-benefits and trade-offs into the decision-making process. For multiple-benefit conservation action and policy to be successful, evidence of true benefits and transparency in trade-offs is required to optimize conservation outcomes.

Breaking through biases: what we've learned from female birds

Organizers: Karan J. Odom (Cornell Lab of Ornithology), Ruth E. Bennett (Smithsonian Migratory Bird Center)

Morning – Wednesday

Across ornithological disciplines, male birds have been used disproportionately to address ecological and evolutionary questions. In many ways, this reflects the ease of observing males: with their stunning nuptial plumage and high singing rates, males of many species are more detectable and perhaps more interesting to observe than their female counterparts. Yet study biases weaken our ability to understand and make inference about a system. The study of female birds is therefore likely to generate novel ideas and questions about ecological and evolutionary processes within ornithology. Indeed, research that explores the behavioral roles of both sexes has shown us that it is the females of many species that seek out and control the dynamics of extra-pair mating. Likewise, new research into the patterns of female ornamentation (song and plumage) has revealed that strict sexual selection is likely not the only mechanism driving the evolution of elaborate traits. Moreover, ignoring the habitat preferences of

female birds can have detrimental effects on avian conservation: surveys that are biased toward detection of males have led to preferential conservation of male nonbreeding habitats, despite higher rates of habitat loss in female-dominated habitat. This likely contributes to male-bias in the adult sex ratios of migratory passerines. In this symposium we will explore how studies on female birds have altered and expanded our understanding of bird biology. Symposium presenters will speak from a variety of fields (ecology, physiology, behavior, and conservation biology) on the discoveries and surprises generated by a focus on female birds. Our final speaker, Dr. Kevin Omland, will present results suggesting that women researchers are more likely to explore the perspective of female birds, emphasizing how a diverse research community enriches perspectives within ornithology.

This symposium complements other events planned for the 2019 AOS meeting on the role of women in science and will cover parallel topics to a special issue of the Living Bird magazine focused on the study of female birds, planned for release in conjunction with the meeting.

Conservation and management of boreal birds in a changing climate: What do we expect, what have we observed, and what do we do about it?

Organizers: Diana Stralberg (University of Alberta), Steven M. Matsuoka (USGS), Junior Tremblay (Environment and Climate Change Canada)

Afternoon – Wednesday

Climate change is expected to bring rapid and dramatic changes to the boreal forest region of North America, challenging boreal birds and other organisms to keep pace by adapting in place or tracking changing environmental conditions. The magnitude of expected change means that bird conservation and management activities must consider increasingly larger geographies, often spanning multiple jurisdictions. This creates new challenges for conservation research, as scientists struggle to address broad-scale ecosystem transitions across large geographies while also addressing local and regional management needs. Conservation planners and managers are also confronted with high-stakes decisions and trade-offs, given large remaining uncertainties. This begs the related questions: “What are anticipated direct and indirect consequences of climate change on boreal bird populations and communities? What change have been observed to-date? and How does this information influence conservation planning and management decisions?”

To begin to address these questions, we will convene a panel of avian ecologists working in the boreal regions of Canada and the United States, with research foci ranging from basic to applied, and from local to continental-scale. We have asked researchers to present results from various types of predictive modeling efforts, ranging from correlative niche models to landscape change simulation to population demographic models. Others will report results from observational studies of avian responses to contemporary climate change, and plans for validation of modeled climate-change effects. Finally, remaining speakers will address ways in which climate-change information and predictions can be synthesized to inform conservation planning and management of species at risk. Collaborative, cross-jurisdictional case studies will be featured, highlighting how models and data can be translated into conservation action.

Counting unmarked birds - Matching appropriate sampling and modeling techniques with particular research questions

Organizers: Quresh Latif (Bird Conservancy of the Rockies), Jonathon Valente (Migratory Bird Center, Smithsonian Conservation Biology Institute)

Full Day – Friday

In recent decades, analytical methods have advanced tremendously for estimating species occupancy, abundance, and population dynamics from counts of unmarked populations, including point counts. Most approaches employ hierarchical models to separate ecological and observation processes, requiring surveyors to collect auxiliary data (e.g., distance to detections, replicate counts, timing of detections) along with detections. Comparative studies show different approaches can estimate population parameters differently, however, owing to complex interactions among avian behavior, spatial and temporal sampling scales, and modeling assumptions. Indeed, many presenters at the 2018 AOS meeting reported such findings, raising uncertainties about how to interpret parameter estimates appropriately, and how to acquire parameter estimates relevant to particular questions. Increasingly, ornithologists need to demonstrate they have somehow accounted for observation error for their population estimates to be considered defensible. To meet these demands, ornithologists often design studies to include auxiliary data collection without fully exploring whether resulting data will yield desirable inference. Consequently, key insights regarding sampling design often arise with hindsight during data analysis when adjustments to sampling are no longer possible. As analytical methods develop, ornithologists need guidance to design studies appropriately given their questions and potential analyses.

In this symposium, we will explore different perspectives on how to implement count-based surveys of unmarked bird populations. Initial speakers will layout an up-to-date conceptual overview and broad design considerations. Subsequent speakers will examine how study design affects model parameter estimates, new methods for analyzing count data, and integrating multiple sources of information to improve parameter estimates. Biologists with government agencies and NGOs will also provide perspectives on developing monitoring protocols that leverage available analytical tools and data sources to inform conservation and land management. We will conclude the symposium with a half-hour panel discussion, wherein symposium speakers will discuss with attendees approaches and considerations for sampling design, taking into account research questions, available analytical tools, and logistical constraints.

Cross-Pacific migration: how the impossible becomes commonplace

Organizers: Dan Ruthrauff (USGS), Bob Gill (USGS)

Afternoon - Thursday

Up to 20 years ago, ornithological wisdom had it that nonstop migratory flights of more than 5,000 km (e.g., Alaska to Hawaii) were impossible. It was considered unreasonable to suppose that birds would possess enough navigational and physiological capacity to negotiate the length and width of the Pacific. Yet there was tantalizing evidence on the matching timings of departures from Alaska and arrivals in the southern Pacific, as well as record fat loads in apparently departing birds, hinting at the possibility that

individuals of at least one landbird species, the Bar-tailed Godwit, could make nonstop flights across the largest expanse of water on the globe. Not only was this possibility confirmed with satellite trackers, studies on godwits and other species have now spawned many exciting new questions (and some answers) on the amazing physiological, sensory, and informational capacities of birds. In this symposium we assess the state of knowledge of this phenomenon, in the hope that entrepreneurial (young) scientists and their backers will try to expand the story on what appears to be an underappreciated migratory capacity in birds.

Lessons from avian hybrid zones and the maintenance of species boundaries

Organizers: Stephanie M. Aguillon (Cornell University), Jen Walsh (Cornell University), Gemma Clucas (Cornell University)

Afternoon - Thursday

Hybrid zones have played an important role in our understanding of evolution, speciation, and reproductive isolation, and have been the focus of ornithological research for decades. In fact, research in avian hybrid zones has long served as a baseline for formulating general theories about hybridization in non-avian taxa. In addition to this strong history in the scientific literature, new techniques are increasingly being applied to avian hybrid zones—from genomics to demographic modelling—to continue to advance our understanding of both old and new questions about avian speciation. This symposium will include speakers focused on genetics and genomics of avian hybrid zones, as this is a flourishing area of current research. Speakers will represent a range of disciplines to provide a comprehensive overview of ongoing avian hybrid zone research. Additional topics in this symposium include: differences in behavior (e.g., migration patterns, learning, song, timing of breeding) and reproductive success across hybrid zones, patterns of phenotypic variation in hybrid zones, and demographic or niche modelling of hybridizing taxa.

Long-term Studies of Cavity-nesting Birds: Windows into Environmental Change

Organizers: Renee A. Duckworth (University of Arizona), Jeanne M. Fair (Los Alamos National Laboratory)

Afternoon - Friday

Cavity-nesting birds that breed in artificial nestboxes have long been the focus of studies worldwide. Nestbox studies have not only provided insight into essentially every aspect of avian ecology including reproduction, environmental stress, parasitism, and behavior, they have also been at the forefront of work on how contaminants and other environmental stresses affect individuals and populations. Long-term studies of birds are increasingly important for establishing and monitoring the impacts of climate change and we suggest that because of the rich history of detailed monitoring of nestbox populations, these systems are uniquely positioned to provide insight into how birds will adapt. Running parallel to studies of nestbox populations are numerous long-term studies of cavity nesting birds breeding in natural populations. These studies provide crucial insight into population responses to environmental change because they highlight the historical selection pressures that shaped cavity-nesting species and so may shed light on how both natural cavity and nestbox populations will

respond to environmental change. We propose to bring together researchers working on both nestbox and natural cavity systems to share the unique insights that can only be gained from multi-year datasets and to highlight the benefits of studying cavity nesting species in both their man-made and natural habitats.

Migratory Connectivity of Alaskan Birds

Organizers: Autumn-Lynn Harrison (Smithsonian Migratory Bird Center), Lee Tibbitts (USGS Alaska Science Center), Jim Johnson (U.S. Fish and Wildlife Service)

Morning – Thursday

With migrations to every continent and likely to all 5 oceans, talks in this symposium will synthesize the results of nearly 100 years of bird banding in Alaska; share recent research to reveal the migratory connectivity of Alaskan birds; and examine commonalities and differences among bird groups, gaps in knowledge and the implications of changing environments —both within Alaska, and globally—on migratory connectivity.

Topics:

- 1) Insights from 100 years of bird banding in Alaska: Since 1921, 1.3 million individual birds have been banded in Alaska. Of these, 54,000 have been re-encountered outside of Alaska. Four thousand birds banded outside of Alaska have been re-encountered in Alaska. As a part of the Atlas of Migratory Connectivity of the Birds of North America the Smithsonian Migratory Bird Center, in partnership with USGS, has synthesized these data and will present the results.
- 2) Migratory connectivity studies: Spanning biomes (oceans, coasts, wetlands, and terrestrial habitats), groups (passerines, raptors, shorebirds, loons), and techniques (banding, electronic tracking, genetics, stable isotopes), a range of presenters will share recent work to reveal the migratory connectivity of Alaskan birds.
- 3) Integrating available knowledge: A summary talk will integrate results from multiple methodological approaches, present a gap analysis of available knowledge, and discuss opportunities and information needs for the future.

Molecular ecology is for the birds: using molecular techniques to advance our understanding of avian ecology

Organizers: Michelle A. Jusino (University of Florida), Teresa J. Lorenz (United States Forest Service)

Afternoon - Thursday

Molecular based techniques have exploded in many fields because they give insights into the intricate relationships among organisms, microbiomes, immunity, diet, and more. Molecular ecology has helped us gain a better understanding of the biodiversity and complexity of communities of fungi, bacteria, arthropods, and other organisms associated with birds using new techniques, tools, and next-generation data. Yet, we are still on the tip of the iceberg; many ornithologists have not been trained in the lab and

field-based molecular techniques required to accurately characterize communities from environmental samples. Fields such as bacteriology and mycology have long embraced molecular tools for understanding the ecologies and natural histories of study organisms – these tools are now beginning to be used by the ornithological community to answer similar natural history questions. This symposium will explore the possibilities that these techniques offer to ornithology, facilitate collaboration and cross-disciplinary research approaches, and highlight exciting new research utilizing these techniques. Attendees will learn how high-throughput sequencing methods and related techniques have become accessible, and widely used, and our final discussion will facilitate collaboration and encourage more researchers to embrace these new opportunities.

In this symposium we will: 1) review methodological advances in molecular ecology that allow us to accurately characterize communities from environmental samples, 2) discuss the most important kinds of questions that these powerful new tools allow us to answer, 3) see concrete specific examples of how molecular ecology is revolutionizing ornithology, and 4) facilitate a collaborative discussion between researchers who are using advanced molecular techniques to study avian ecology and those who would like to learn more. At the end of the symposium we will have an open discussion about the role of molecular community ecology in the future of ornithology, and which tools are on the leading edge of this research.

Permeable Boundaries in Biological and Social Sciences: Human Dimensions in Bird Research and Conservation

Organizers: Liliana Naves (Alaska Department of Fish and Game, Division of Subsistence), Jacqueline Keating (Alaska Department of Fish and Game, Division of Subsistence), Ashley Dayer (Virginia Tech) Jessica Barnes (North America Bird Conservation Initiative), Terrell Rich (Boise State University)

Full Day – Thursday

The objective of this symposium is to highlight the value of social science in understanding and managing the complex socio-ecological systems that include birds. Bird conservation issues are often intertwined with human activities and behaviors. Combining ornithological and social science theory and methods is a highly effective way to scientifically assess socio-ecological systems, answer research questions, and solve management and conservation issues. Yet, consideration of human dimensions as part of the causes and solutions to issues in resource management and conservation is often insufficient. Formal consideration of human dimensions in resource management is also key to support the well-being of communities and a better integration of people and nature. For instance, changing the behavior of dog owners is necessary for Piping Plover conservation, and considering indigenous knowledge and ethnotaxonomy improves shorebird harvest assessment and facilitates the engagement of subsistence users in shorebird conservation.

The symposium will begin with an introduction to social science theory and methods as applied to resource management. Following presentations and discussions will explore the breadth of the utility of conservation social science under three main topics: (1) understanding human behavior; (2) application of human dimensions research in the management and conservation of bird populations; and (3) stakeholder engagement in bird research and conservation. Individual talks will cover: conservation behaviors of people and organizations; integration of traditional knowledge into research and

management; management of species of conservation concern; applied ethno-ornithology; citizen science; conservation in private lands; and the integration of human dimensions into conservation planning and delivery. Closing the symposium, organizers will address questions, comments, and suggestions collected on note cards along the day, including actions to further integrate Human Dimensions in bird research and conservation.

Highlighting successful interdisciplinary collaboration, this symposium will offer opportunities to AOS meeting participants to meet and forge collaborations with researchers, managers, and practitioners experienced in human dimensions. Participants will be empowered with knowledge and resources to start or boost interdisciplinary collaborations including human dimensions to solve bird-related research, conservation, and management issues in diverse geographic and socio-ecological contexts..

Seabirds on the edge of two worlds: ecology and conservation of *Brachyramphus* murrelets in marine and terrestrial environments

Organizers: James Rivers (Oregon State University), Michelle Kissling

Afternoon - Friday

Seabirds are apex predators in marine food webs, and often are used to monitor marine ecosystem health. Among seabirds, *Brachyramphus* murrelets are unique in several ways. First, they are dispersed nesters, so many aspects of their ecology cannot be examined at breeding colonies as in other seabird species. Second, they typically undertake extensive daily movements between the ocean and nesting sites – sometimes in excess of 200 km round-trip – making them species of two distinct, yet interrelated ecosystems. Finally, *Brachyramphus* murrelets exist on the edge of energetic constraints during breeding owing to their large commuting distances between marine foraging areas and terrestrial nesting sites, and their extensive and intensive habitat requirements. For these reasons, this group has been particularly challenging to study and details of their nesting biology have lagged far behind all other groups in North America. Moreover, both Marbled Murrelet (*B. marmoratus*) and Kittlitz's Murrelet (*B. brevirostris*) have experienced population declines throughout most of their ranges, with the Marbled Murrelet federally listed in Canada and the conterminous United States. Their threatened status and the dearth of information on most aspects of their life history have made research on space use, movement, and nesting biology especially critical for guiding conservation planning and population recovery for these species. In this symposium, participants will provide new information, much of which is not published yet, that enhances our understanding of the ecological importance and conservation needs of *Brachyramphus* murrelets in North America. The symposium is expected to be of interest to a diverse audience, including researchers, government scientists, managers, and policy and decision makers.

Social Dynamics in Interspecific Interactions

Organizers: Allison E. Johnson (University of Nebraska-Lincoln), Daizaburo Shizuka (University of Nebraska-Lincoln)

Afternoon - Wednesday

Interspecific interactions--e.g., competition, mutualism, and other mixed-species associations--are central to ecological theory. Because interspecific interactions occur between individuals, there is potential for the evolution of social strategies to mediate both positive and negative interspecific interactions. For example, dynamics of communication, individual recognition, conflicts of interest, and leadership can affect the nature of species interactions in birds. However, there remains a large gap in our knowledge about how the complex interplay between ecological and social factors shape interspecific interactions in nature. In this symposium, we bring together cutting-edge research in ornithology that push the boundaries of our understanding of how interspecific social dynamics work and how they can affect larger ecological and evolutionary patterns such as species community assembly and phenotypic evolution.

This symposium will address interspecific social dynamics in birds in a variety of contexts including interspecific competition, mixed-species flocks and communication networks. By bringing together new research in these different contexts, we find common threads that unite these themes: Are social dynamics within and between species qualitatively different, or do they lie along a continuum? How does the network structure of interspecific interactions tell us about social dynamics between species? How does the flow of information within and across species influence patterns of interspecific interactions? How do conspecific and heterospecific social dynamics influence each other? Collectively, our symposium demonstrates the richness of behavioral dynamics that occurs across species and how they shape patterns of biodiversity in birds.

This symposium will also highlight the diversity of research approaches to understanding the complexity and importance of sociality across species, including new modeling techniques, social network analysis, meta-analyses, citizen science platforms, and field experimental approaches. We have assembled a highly international set of speakers representing 7 countries, collectively addressing study systems from 5 continents. We also have representation from a broad range of career stages, including graduate students, postdocs and faculty. An explicit goal of the symposium will be to foster communication between leading researchers within these themes to begin work towards a unifying concept for understanding social dynamics of interspecific interactions.

Species Limits in Birds: Integrative and Practical Considerations for Taxonomy

Organizers: Kevin Winker (University of Alaska Museum), Pamela Rasmussen (Michigan State University)

Afternoon - Wednesday

Birds have long been a focus of research on divergence and speciation, but even with the increasingly large datasets allowed by current technology, species delimitation is often controversial. In this symposium we will emphasize the reasons why species taxa are of special importance in biodiversity research, ecology, and conservation. Setting aside debates about species concepts, we will focus on some of the challenges of using phenotypic and genetic datasets to achieve more robust species-level taxonomies that will be widely accepted and thus stable. The appreciation of humans worldwide for birds means that avian taxonomy, and thus avian taxonomists, more than for most other taxonomic groups, have an often contentious and complex relationship with the biopolitics of management, conservation, and birding. We will review some of the real-world difficulties of partitioning groups of populations, which are products of the continuous process of avian divergence, into the taxonomic bin of

species. Presentations will be rich with examples of integrative work, complex taxa, and lessons learned in applying taxonomic solutions. We also hope to identify potential solutions for some of the thorniest problems in avian taxonomy. While we do not expect to achieve consensus on species concepts or limits through this symposium, our overarching goals are to explore current problems and solutions for creating taxonomies that will be as scientifically and operationally defensible as possible.

The Future of Global Bird Trait Datasets: A Game-changing Resource for Macroecology, Macroevolution and Conservation Biology?

Organizers: Joseph Tobias (Imperial College London, UK), Matthias Schleuning (Senckenberg Biodiversity and Climate Research Centre (SBIK-F), Germany), Catherine Sheard (University of St Andrews, UK)

Full Day - Friday

The influence of functional traits on ecology and evolutionary biology has grown rapidly over recent decades, but most of the attention has thus far focused on plants, partly because they are so amenable to direct measurement by fieldworkers and in herbaria. Botanists measuring traits have paved the way for numerous advances in these fields, particularly in community ecology, as well as global initiatives for sharing and analysing plant trait data. Despite the many advantages of plant traits, macro-scale analyses focusing on these datasets come up against several important limitations, including huge gaps in data sampling (typically <30% species coverage), extreme intraspecific variation, and a relatively tenuous link between morphological traits and ecological functions. To provide a different perspective, the focus is increasingly switching to vertebrate traits, and bird traits in particular.

A massive burst of data-compilation activity has progressed haphazardly worldwide over the past decade, based largely on harvesting information from ornithological literature and measuring anatomical and morphometric traits from museum specimens and wild birds. We have now reached a critical mass of datasets, both published and unpublished, covering a wide range of categorical and continuous traits, relating to many aspects of biology. These trait datasets are now available for almost all species of birds and it's becoming clear that, coupled with comprehensive information on avian geographical ranges and phylogenetic relationships, they can provide a quantitative framework for analyses spanning a wide range of fields, including macroecology, macroevolution, behavioural ecology, community ecology and conservation biology.

The next generation of broad-scale trait-based studies is already underway, and several global projects are approaching major milestones or final completion. In this symposium, we aim to review progress and discuss the key opportunities and challenges ahead. We will focus on the prospects for developing new analytical approaches suited to the higher trophic levels and multitrophic interactions relevant to birds, and for applying these trait-based approaches to ecosystem science and conservation biology. Throughout, we will give particular attention to the ways in which bird traits offer new possibilities, including near-100% species coverage, a clear link between traits and ecological functions, and insights into multi-trophic interactions, for example by linking with plant traits. The overall goal is to kick-start the next phase of trait-based ornithology by highlighting the strengths and uses of avian trait datasets, and the new cutting-edge methods designed to capitalise on them.

Translational ecology - producing actionable science

Organizers: Sarah Saunders (National Audubon Society), Joanna Wu (National Audubon Society), Brooke Bateman (National Audubon Society), Nicole Michel (National Audubon Society)

Afternoon - Friday

Translational ecology is an intentional approach in which ecologists, stakeholders, and decision-makers work collaboratively to develop and deliver ecological research that addresses the sociological, ecological, and political contexts of an environmental problem. This subfield differs from applied ecology because the latter does not require direct, deliberate engagement of end-users of scientific information, nor does it acknowledge shared responsibility for delivering research outputs that are tangible. Hence, translational ecology is a user-driven, iterative process aimed at producing actionable science that extends beyond use-inspired science to foster meaningful dialogue among multiple parties. This iterative, multi-stakeholder process is similar to adaptive management, but the focus of translational ecology extends beyond managing natural resources. Importantly, translational ecology draws on the concepts and strategies from the social sciences that have been effective at bridging the divide between research and decision-making communities.

In this symposium, we would like to bring together leaders who are specializing in translational ecology to tackle some of today's most pressing issues in avian conservation and management. Ecologists, avian biologists, conservation practitioners, and social scientists will share insights and case studies from their work at the intersection of science and practice. Invited talks will highlight (1) recent, successful applications of translational ecology specifically related to birds; (2) the challenges faced during scientist-stakeholder engagement; and (3) ongoing projects that were initiated to explicitly produce science with real-world impacts on avian conservation and policy.

Understanding and addressing the collapse of the North American Avifauna

Organizers: Peter Marra (Smithsonian Migratory Bird Center), Kenneth Rosenberg (Cornell Lab of Ornithology)

Full Day - Wednesday

Species extinctions have defined our global biodiversity crisis, but species loss begins with depletion in abundance of organisms that can result in extreme compositional changes in ecosystems. A recent (Science) paper documented major population losses across much of the North American avifauna, using independent monitoring networks. Survey data show a net loss in total breeding abundance nearing three billion birds, 29% since 1970, in species occupying most continental biomes. Grassland specialists exhibit the largest absolute loss of abundance, while wetland birds show modest gains. Continent-wide NEXRAD radar reveals a similar decline in nocturnal bird migration of approximately 9% over the past decade. Our symposium will present a synthesis of recent avian declines, describe available monitoring programs for the birds of North America and explore what we know (and don't know) about the causes of these declines in a few select biomes.

The old adage "canary in the coal mine" is proverbial for good reason. Birds are excellent indicators of environmental and ecosystem health. They are conspicuous, easy to identify and count, and fortunately,

ornithologists began monitoring hundreds of species over vast spatial scales almost a half century ago. In this symposium, speakers will present data from the first ever systematic and quantitative estimates of population loss and trend, for almost the entire avifauna of North America. Experts will come together to present long-term data for various taxa, from grasslands and boreal species to shorebirds and waterfowl—highlighting both patterns and probable causes of declines. In addition, using an entirely independent and new dataset from 143 weather radars (NEXRAD) across the contiguous U.S., we will show how the results from intense monitoring efforts are mirrored by declines in nocturnal bird migration. What's most alarming is that these declines are not isolated to rare and threatened species; talks will highlight significant declines in species once considered common and widespread—including non-native species. One take home message from the symposium is that the cumulative loss of almost three billion birds is consistent with a decay of overall ecosystem integrity.

The good news is that nature is resilient and if given a chance species can rebound. We will highlight several examples including the remarkable recovery of intensively managed waterfowl. And toward the end of the symposium, we will discuss approaches for identifying the causes of decline (through a horizon scanning process) coupled with effective policies and societal change to reduce threats to habitats and minimize avoidable anthropogenic mortality, so species can recover. Recent attempts to weaken laws in the United States to protect birds, would have severe implications, and make our symposium even more timely and important. A policy wrap-up talk will bring attendees up to date with changes in the Migratory Bird Treaty Act.

Wild birds and the One Health initiative: Dynamic boundaries affect the health of birds, livestock, humans, and the environment

Organizer: Andrew Ramey (U.S. Geological Survey Alaska Science Center (USGS ASC))

Moderators: Andrew Ramey, USGS ASC; André Dhondt, Lab of Ornithology Cornell University; Jonas Bonnedahl, Department of Clinical and Experimental Medicine Linköping University

Full Day - Friday

The One Health initiative strives to forge collaborations between doctors, veterinarians, and environmental scientists to find solutions to the most pressing societal issues threatening the health of people, animals, and our environment. The objective of this symposium will be to bring together professionals from diverse clinical, governmental, and academic organizations to share their experiences conducting research on avian health and disease within the One Health framework. We hope to foster cross-pollination of ideas across disciplines and to encourage new collaborations.

Specific topics to be covered include: (1) an introduction to the One Health initiative and how it applies to wild birds; (2) research on avian influenza in wild birds and important lessons learned regarding the world's most economically costly poultry disease; (3) how a poultry disease has evolved to exploit a niche in wild birds; (4) the utility of wild birds in the surveillance for clinically relevant antibiotic resistance determinants; (5) how West Nile Virus, a cause of disease in humans, also impacts wild woodland birds; (6) how the effects of harmful algal blooms may affect the environment, seabirds, and subsistence users; (7) connections between urbanization, disease, and white ibis; and (8) what we know and don't know about temperature-limited parasites in the warming far north.