

Hot Topics in the Tropics: Research to Support Full Life-Cycle

Conservation of Migrants

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Symposium Organizers

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Neotropical migratory birds continue to decline, despite decades of research and conservation planning; clearly a more integrative, full-life-cycle approach is necessary, that links primary research to on-the-ground conservation. The objective of this symposium is to engage avian researchers, especially students and post-docs, in a dialogue with conservation practitioners about the most important questions and research priorities that must be addressed to enable the conservation of Neotropical migratory birds on their wintering grounds. Conservation of migratory birds requires coordinated actions throughout their life cycle, including research on seasonal connectivity between breeding and non-breeding locations, and on important factors limiting survival and productivity throughout the life cycle. Yet, relatively few studies have enabled the targeting of effective conservation actions to benefit migrants (and associated residents) on the wintering grounds. It is crucial to focus on research efforts that answer the most important questions about full life-cycle connectivity and limiting factors as applied to conservation; thus, this symposium will identify these critical gaps and also highlight novel techniques and technologies that enable us to address key questions in new ways.

ABSTRACTS of PRESENTATIONS (as submitted)

Filling Knowledge Gaps to Enhance Full Life-Cycle Bird Conservation: Partners in Flight's Tri-National Vision.

KENNETH V. ROSENBERG (Cornell Lab of Ornithology), JANET M. RUTH (USGS), CAROL J. BEARDMORE (US Fish and Wildlife Service – Sonoran Joint Venture), WENDY EASTON (Canadian Wildlife Service), THOMAS WILL (US Fish and Wildlife Service), DAVID PASHLEY (American Bird Conservancy).

Neotropical migratory birds continue to decline, despite decades of research and conservation planning; clearly a more integrative, full-life-cycle approach is necessary, that links primary research to on-the-ground conservation. Partners in Flight recently released ***Saving our Shared Birds: Partners in Flight Tri-National Vision for Landbird Conservation***, which provides the first comprehensive conservation assessment of landbirds in Canada, Mexico, and the continental United States. Effective bird conservation must be based on the latest science; yet relatively few studies have enabled the targeting of effective conservation actions to benefit migrants (and associated residents) on the wintering grounds. In particular, conservation of migratory birds requires coordinated actions throughout their life cycle, including research on seasonal connectivity between breeding and non-breeding locations, and on important factors limiting survival and productivity throughout the annual cycle. We also need to expand our knowledge base on population status, distribution, habitat needs, and threats faced by migrants on their wintering grounds, as well as response to management actions and environmental change. The following talks in this symposium highlight advances in field and analytical methodologies, synthesize recent results on migratory connectivity, demographic modeling, and conservation genetics, and provide perspectives from conservation practitioners attempting to apply these research results to on-the-ground projects at regional and hemispheric scales. All speakers have been asked to describe how research results in their fields can be applied to bird conservation planning and actions, and identify the next breakthroughs and future research priorities that will enable effective full-life-cycle conservation. Our intent is to begin a dialogue among researchers, students, resource managers, and policy-makers so that collectively we can take on the challenge of addressing critical research questions and linking research results to conservation decision-making.

The Nexus of Non-Breeding, Migratory, and Breeding Life-History Stages in Migratory Songbirds.

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In spring, migratory birds are at the juxtaposition of three life history stages in which they must complete the non-breeding stage, initiate and complete migration, and initiate breeding. For many species, this transitional period is critical because the timing of arrival at breeding areas can influence reproductive output. We sought to determine a) when physiological preparation for breeding begins, b) if variation in breeding preparation is better explained by endogenous or environmental factors, and c) if breeding preparation can influence migration phenology. We found that male American Redstarts (*Setophaga ruticilla*) wintering in Jamaica show evidence of breeding preparation prior to departure from wintering grounds while females do not. In both these male redstarts and migrating Ovenbirds (*Seiurus aurocapilla*) collected in Chicago, we found that variation in breeding preparation (measured by circulating testosterone, T, and testis size) was better explained by environmental factors (condition, winter habitat wetness measured by stable-carbon isotopes) than endogenous timing (distance to breeding site measured by stable-hydrogen isotopes). Lastly, we demonstrated experimentally that male redstarts who elevate T earlier than competitors are more likely to depart earlier on migration, presumably enabling them to arrive earlier to breed, a strong determinant of reproductive success. These results demonstrate that life history stages greatly overlap for migratory birds and can interact with one another to potentially influence fitness. Our findings have implications for the ability of these species to respond to changing environments.

Recent Advances in Understanding the Limitation and Regulation of Migratory Passerine Populations Throughout the Annual Cycle.

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The abundances of migratory songbirds are determined by the seasonal interactions of events that can occur over thousands of kilometers and on different continents. Therefore, understanding the relative impacts of limiting and regulatory processes in the stationary and migratory periods, as well as how such impacts carry-over between seasons, is essential. We use demographic data from our long-term, full life-cycle studies of American Redstarts (*Setophaga ruticilla*) and Black-throated Blue Warblers (*S. caerulescens*) to show that these populations are limited (e.g. by weather and food) during all phases of their annual cycle and are regulated by both density-dependent fecundity and survival. We use stage-structured, population projection models to illustrate how the relative influence of these limiting and regulatory processes covary and are shaped by the strength of connectivity between breeding and winter grounds. Our results emphasize the need for a full life-cycle approach to understand the factors that underlie population dynamics and to conserve migratory bird species.

Technological Advances in the Study of Conservation Genetics and Seasonal Connectivity of Long-Distance Migrants: An Exciting Future.

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Knowledge of migratory connectivity between breeding and wintering regions is fundamental to understanding the ecology, evolution, and conservation of Neotropical migrants. Technologies such as multiple-locus DNA analysis, feather isotope analysis, and geolocators have allowed exciting advances in our ability to elucidate patterns of connectivity. I review recent examples of migratory connectivity research, highlighting in particular the case of the Wilson's warblers. Our analysis of 257 variable DNA markers among breeding and wintering Wilson's warblers showed two highly divergent western and eastern breeding groups, apparently corresponding to two distinct migratory groups that are likely distinct cryptic species. A wide variety of other species also consist of western and eastern forms with different migratory routes and wintering areas. There is very little genetic variation within both the western and eastern groups of Wilson's warblers, making it challenging to discern patterns of connectivity within each group. Fortunately, recent advances in next-generation sequencing technology have provided a solution for such situations: by scanning many tens of thousands of single-nucleotide polymorphisms, one can determine the small subset of markers that vary geographically and are likely under selection, and then use those markers to reveal patterns of connectivity. Such an approach still depends critically on sufficient sampling of both the breeding and wintering regions, necessitating large collaborative arrangements and willingness of individual researchers to contribute genetic samples to such studies. I encourage funding agencies and conservation organizations to consider ways to establish and support DNA repositories that would enable such work. By creatively combining next-generation sequencing with technologies such as light-level geolocators and isotope analysis, researchers are likely to make dramatic progress in the study of migratory connectivity within the coming decade.

Designing a Neotropical Landscape for Migrants and Residents: Applying Research Results for On-the-Ground Conservation.

ROSA MARIA VIDAL (Pronatura Sur, Chiapas, Mexico), CLAUDIA MACIAS-CABALLERO, EFRAIN CASTILLEJOS-CASTELLONES.

Bird habitats in the Neotropics are facing a rapid change due to the processes of urbanization, population growth, and deforestation. Today's landscapes are composed of a mixture of fragmented patches of vegetation, agricultural lands, and human settlements. In Mexico, only xxx% of the natural vegetation remains, and deforestation is continuing at a rate of xxxx. Our challenge is to maintain enough suitable habitat for the largest number of migratory and resident species within this matrix. We discuss the application and integration of research results into the Pine-Oak ecoregional conservation plan, as well as within the Mesoamerican Biological Corridor. We present and discuss data from comprehensive studies that have been

carried out since 1990 on the winter distribution of Golden-cheeked Warbler (*Setophaga chrysoparia*) in the Neotropics, including results of standardized monitoring for the entire winter range, studies on habitat use, composition of mixed flocks, and GIS analysis. These results have been used at different scales for conservation decision-making, such as ecoregional planning, identification of specific conservation sites, designation of Important Bird Areas, and recommendations for forestry management techniques. A similar approach has been followed for strengthening the Mesoamerican Biological Corridor concept, in which results of bird studies conducted by several authors during the last 20 years continue to be used for improving coffee production plantations, forest restoration, and watershed management. Studies that have greater applicability for these initiatives are those in which specific habitat features are identified and which incorporate human activities that can be adapted to allow those conditions to persist. Basic research continues to be needed, including population studies, foraging and resource use within various habitats, ecology and interactions between resident and migratory birds, as well as regional and latitudinal distribution of species within a landscape matrix. Greater interaction among research institutions, conservation groups, and government agencies is one of the most important steps in integrating scientific research into conservation action.

A Hemispheric Perspective on Neotropical Migratory Bird Conservation: Where do We Go from Here?

IAN J. DAVIDSON, Nature Canada, Ottawa, Canada and ROB CLAY, BirdLife International, Quito, Ecuador

The U.S. and Canadian State of the Birds Reports highlight significant declines in landbird species, especially aerial insectivores, grassland dependent birds and high arctic species. Despite our efforts over a 25 year period, it is increasingly clear that we are seriously challenged by the enormity of the task to conserve Neotropical migratory landbirds. Not only do we lack sufficient knowledge of species movements, distribution and abundance, but even with this knowledge, our conservation actions are limited by available funds, differing priorities and a lack of capacity. Nonetheless, in the last ten years we have seen a growth in innovative, multi-stakeholder driven, cross-sectoral efforts to conserve Neotropical migrants. Perhaps the most exciting developments are coming from the large landscape initiatives in Latin America and the Caribbean that focus on flagship landbird species such as the Golden-cheeked Warbler (*Setophaga chrysoparia*) of the pine oak forests of Mesoamerica, Bicknell's Thrush (*Catharus bicknelli*) of the Greater Antilles, Bobolinks (*Dolichonyx oryzivorus*) of the pampas, and Cerulean Warbler (*Setophaga cerulea*) of the northern Andes. These "joint venture initiatives" or "species alliances" demonstrate the value of partnerships and offer a platform for un-raveling the mysteries of species life-cycles. The results can then inform the development of effective strategies to tackle the conservation challenges facing Neotropical migrants. The *Partners in Flight Tri-National Vision for Landbird Conservation* provides an important road map for conserving migratory birds in North America. However, if we are to successfully conserve Neotropical migrants, we will need to reach beyond political borders and embrace the

complete life-cycle of migratory birds. We present highlights from successful migratory bird conservation initiatives and based on these, propose strategies for bringing a hemispheric-wide vision to the ground.

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