Study traces evolutionary origins of migration in New World birds

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The Baltimore Oriole is one of many songbirds featured in The Field Museum's latest study. Credit: Arlene Koziol (c)2014 The Field Museum

Every year, millions of birds make the journey from North America to Central and South America for the winter. But the evolutionary origins of this long-distance migration have remained opaque due to the complex geographic distributions of modern and ancient bird ranges.

Now, a team of scientists from the University of Chicago have developed a new method to reveal the ancestral ranges of New World birds, and discovered that bird migration in the Americas evolved in species that resided in North America. Their work also offers evidence that many tropical bird species descended from migratory ancestors that lost migration. The study was published Aug 4 in the *Proceedings of the National Academy of Sciences*.

Seasonal migration – which occurs when species breed in one geographical area and winter in another – is commonly hypothesized to have evolved as ancestral species native to the tropics began to shift their breeding ranges northward. However, this has been difficult to prove as hundreds of species with large and dynamic geographic ranges have to be studied.

To better understand the evolutionary origins of this phenomenon, Benjamin Winger, a graduate student of the Committee on Evolutionary Biology at the University of Chicago, and his colleagues Keith Barker, PhD, a University of Chicago alumnus now at the University of Minnesota in St. Paul, and Richard Ree, PhD, of the Field Museum of Natural History in Chicago, developed a new model to infer the historical geographic distributions of migratory birds.

Using emberizoid passerines – the largest lineage of New World migratory birds, which includes warblers, sparrows, orioles, blackbirds and cardinals – Winger and his colleagues described over 750 passerine species' breeding and wintering patterns by geographical location. They mapped these ranges to a phylogenetic tree – a diagram which shows the evolutionary relationships of each passerine species and their common ancestors – to reconstruct where ancestral passerines lived. The team then computationally inferred the trends in range evolution among ancestral and descendant birds.

Contrary to common hypotheses, they found that the most likely origin of migration in this group lay in ancestral species that resided in North America and gradually moved further and further south for the winter. Shifts in range from North America to tropical areas were the dominant pathway for geographical change, and evolved much more frequently than shifts northward from tropical areas. They also found evidence that ancestral migratory bird species colonized the tropics, eventually losing migration and diversifying into the species that today stay in the tropics year-round.

"We find that a North American species is ancestral to migratory birds in the New World," said Winger, who is the corresponding author on the study. "It's been assumed that because species density is so high in the tropics, that migratory birds must come out of the tropics. But our study suggests the opposite happened more frequently in this group. The evolution of migration is a complex system. Our study highlights the importance of using phylogenies to study this phenomenon."

More information: Temperate origins of long-distance seasonal migration in New World songbirds, *PNAS*, www.pnas.org/cgi/doi/10.1073/pnas.1405000111

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