



## The Andean region

Carlos Daniel Cadena

Many areas of northern South America are biodiversity hotspots - places where three different components of avian diversity concentrate: total bird species, endemic bird species (those with restricted distribution ranges), and endangered bird species. Explanations for the exceptionally high avian diversity and endemism of the region are manifold, but the role of the Andes, the largest and topographically most complex tropical mountain system in the world, figures prominently in many such explanations. The rugged topography and environmental heterogeneity of these mountains, which completed their final uplift some 2 to 5 million years ago, are associated with a great diversity of habitats (from dense and tall premontane forests in the warm foothills to stunted or open vegetation above the treeline at high and cool elevations, to high elevation wetlands in altiplanos) that can accommodate a variety of species with different ecological requirements. From a historical perspective, the uplift of the Andes created new environments to which species from the South American lowlands and even from alpine, temperate-zone areas were able to disperse and adapt. Furthermore, the Andes have acted as a major species pump, where lineages have extensively diversified, largely as a result of physical isolation of populations caused by geographic and ecological barriers to dispersal (e.g. dry or low-elevation river valleys) and by a dynamic climatic history in the past million years over which different vegetation zones periodically contracted and expanded along mountain slopes, tracking changes in temperature and humidity. The Andean landscape has also likely promoted the origin of montane species as a result of adaptation via natural selection along steep environmental gradients and had a crucial role in the diversification of lowland fauna by separating large blocks of tropical forests such as the Chocó and Amazonia, where multiple species have evolved in isolation owing partly to the effect of the Andes as an insurmountable barrier to dispersal for many lineages.

In Colombia, the Andes separate in three different cordilleras that run in North-South direction across most of the country, with the Cauca and Magda-

lena river valleys running in between them. The existence of these different mountains has not only contributed to the tremendous heterogeneity of environments and bird diversity in Colombia, owing to their effects on climate and consequently on avian distributions –for example, wet, lush, epiphyte-laden forests occur on slopes intercepting clouds whereas dry, scrubby, and thorny environments characterize rain-shadow slopes– but has also influenced the differentiation of bird populations such that each cordillera (and even opposite slopes within a cordillera) has a unique avifauna, with numerous endemic species. This, added to the fact that bird assemblages occurring at different elevations within cordilleras differ substantially in species composition, implies that the spatial turnover of avian species diversity in the Colombian Andes, a measure that ecologists refer to as beta-diversity, is remarkably high. Even in groups in which population differentiation has seemingly not scaled up to the origin of distinct, closely-related species occurring in different cordilleras, geographic variation among cordilleras within many widely distributed species in traits related to external phenotype (plumage coloration and pattern, body and bill size), behavior (songs), and genetics (e.g. mitochondrial DNA sequences) is pronounced. Many such geographic variants likely merit species status and await careful studies. Moreover, the diversity of Andean forest birds in Colombia remains insufficiently known, as exemplified by the remarkable recent discoveries of spectacular species new to science, such as the Chestnut-capped Piha; indeed, Andean bird species new to science have been recently discovered within a few kilometers and even in the outskirts of major cities, including Bogotá (Cundinamarca Antpitta), and Armenia and Pereira (Stiles's Tapaculo).

Unfortunately, the history of human settlement, development, and social conflict in Colombia has taken a strong toll on Andean natural environments. Many of the major urban centers in the country are located in the Andes, and coffee plantations, once the main driver of our economy, concentrate at mid-elevations in the Andes. Deforestation and habitat degradation associated

with urban development, agriculture, cattle raising, and, increasingly over recent years, illicit crops have resulted in a dramatic decline in the extension of natural vegetation in the Andes. One of the few “rules” in ecology and biogeography is that the number of species occurring at a site is a function of the site’s area, and Colombian montane forest birds are no exception to this rule. Studies conducted at montane forest sites in the Cordillera Occidental and Cordillera Central, for which baseline information of avian inventories prior to extensive habitat destruction and degradation was available, revealed the local extinction of up to 30% of forest bird species over the twentieth century, with groups such as terrestrial insectivores and large frugivores being particularly susceptible to such habitat alterations. More generally, of 152 Colombian bird species considered to be under some degree of threat, 111 occur at mid- to high elevations in the Andes or in other montane systems of the country, such as the Sierra Nevada de Santa Marta. Some recent assessments highlighted a dearth of national parks and nature reserves to protect threatened and endemic birds in the Colombian Andes, a situation that has begun to be somewhat alleviated with the establishment of a few new national parks (e.g. Serranía de los Yarigués in the Cordillera Oriental and Selva de Florencia in the Cordillera Central) and by an increasing interest by NGOs and individuals in establishing private nature reserves. These valuable efforts notwithstanding, multiple Andean birds remain in trouble and many species, including several that are not thought to be currently threatened, face a major looming threat: climate change. Global warming is expected to strongly affect tropical montane species owing to their narrow ecological niches and to the contraction and disappearance of high-elevation environments.

Birding in the Colombian Andes is exciting. Not only is there an astonishingly large number of species to see (many of which are not found anywhere else), but the restricted distribution of many species and the marked turnover of avian assemblages with elevation or across valleys provides many challenges and opportunities for birders interested in boosting their life-lists and

for ornithologists wanting to better understand species distributions. Also, the prospect of documenting significant range extensions in unexplored sites and even of discovering species new to science make ornithological forays into the Colombian Andes especially thrilling. I recently visited Tatamá National Park, one of the most gorgeous highland sites I have been to. Located in the limits between the Departments of Risaralda, Valle del Cauca, and Chocó, the very wet cloud-covered forests above 1500 m on the mountain slopes facing the Pacific gave us the opportunity to see many spectacular montane specialties such as Velvet-purple Coronet, Toucan Barbet, Club-winged Manakin, Fulvous-dotted Treerunner, Black-chinned Mountain-Tanager, and Gold-ringed, Black-and-gold and Glistening-green tanagers, among many others. Three days in Tatamá were too few and all the birds we missed seeing left me wanting to stay longer. Back home a few days later, however, I was reminded of something that we often tend to forget: despite being a major urban center dominated by concrete, pollution, and chaos, Bogotá is still surrounded by small patches of native Andean vegetation that have managed to persist and where several montane forest bird species survive. During a quick hike and run in the Quebrada La Vieja in the Cerros Orientales of the city, the sounds of Undulated, Rufous and Chestnut-crowned Antpittas, of Gray-breasted Wood-wrens and of Matorral Tapaculos, and brief sightings of an Amethyst Sunangel and of a nesting pair of Moustached Brush-finches were a reminder that many unique and beautiful Andean forest birds still live pretty much in our backyards. Moreover, crossing paths with people from all walks of life that enjoy hiking and experiencing a bit of nature in the area gave me some sense of hope that these backyards still hold some promise for conserving our birds. A week later, witnessing the emotion of some of my beginning biology students while listening to Bogotá Rails and observing Yellow-hooded Blackbirds in polluted wetlands immersed in urban areas of Bogotá only reinforced this sense.