



The importance of riparian habitats for avian communities in a highly human-modified Neotropical landscape

La importancia de los hábitats riparios para las comunidades de aves en un paisaje neotropical altamente modificado por el ser humano

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Abstract. Intensification of agriculture and urban development are the main forces degrading natural ecosystems, particularly within species-rich countries. In this study, we determined the variation in bird communities between anthropogenic (i. e., cattle grazing lands, crop fields, urban areas) and riparian habitats within a highly human-modified landscape in northwestern Colombia. For this purpose, we assessed differences in bird community diversity, structure, and composition among studied habitats. We also investigated similarities of surveyed habitats according to the habitat preferences of species. Results showed that riparian habitats play a fundamental role in human-dominated landscapes, as they maintain diverse and complex bird communities, support interior forest bird species, and might promote heterogeneous bird communities in nearby habitats. Cattle grazing lands also exhibited heterogeneous bird communities, which might be a result of the presence of tall trees, abundant shrub cover, and proximity of riparian habitats. Few species were over dominant within crop fields and urban areas due to a simple vegetation structure, leading to homogeneous avian communities where disturbed-site species thrive. Given that increasing human population depends on agricultural and urban ecosystems worldwide, there is an urgent need to foster management and conservation activities within such ecosystems to support wildlife and enhance human welfare.

Key words: agriculture, birds, cattle grazing lands, cities, Colombia, rivers, urbanization.

Resumen. La intensificación de la agricultura y el desarrollo urbano son los principales factores de degradación de los ecosistemas naturales, particularmente en los países ricos en especies. En este estudio determinamos la variación de las comunidades de aves entre sistemas antropogénicos (i. e., potreros, cultivos, áreas urbanas) y riparios en un paisaje altamente modificado por el ser humano al noroeste de Colombia. Para ello, evaluamos las diferencias en la diversidad, estructura y composición de las comunidades de aves de los sistemas estudiados. Asimismo, analizamos la similitud entre los sistemas de acuerdo a la preferencia de hábitat de las especies registradas. Nuestros resultados muestran que los sistemas riparios juegan un papel fundamental en el paisaje antropogénico, ya que mantienen comunidades de aves diversas y complejas, alojan especies asociadas al interior de bosques y podrían estar favoreciendo la prevalencia de comunidades de aves heterogéneas en los sistemas adyacentes. Los potreros también exhibieron comunidades de aves heterogéneas, lo cual pudo deberse a la presencia de árboles altos, una alta cobertura arbustiva y la proximidad de los sistemas riparios. Pocas especies fueron sobre-dominantes en los campos de cultivo y las áreas urbanas puesto que estos sistemas presentan una estructura de la vegetación simple, lo cual propicia que las comunidades de aves sean homogéneas y dominadas por especies asociadas a sitios perturbados. Dado que mundialmente la creciente población humana depende de los ecosistemas agrícolas y urbanos, es imperante desarrollar actividades de manejo y conservación asociadas a este tipo de sistemas, de tal manera que sea posible conservar la vida silvestre y mejorar la calidad de vida del ser humano.

Palabras clave: agricultura, aves, potreros, ciudades, Colombia, ríos, urbanización.

Introduction

The socioeconomic changes that occurred during the end of the past century drastically altered natural ecosystems at different scales, resulting in a worldwide reduction of biodiversity (Pimm et al., 1995). In particular, the intensification of agriculture and the exponential growth of urban development resulted in a high rate of land-use change, which is considered to be the main force degrading natural habitats (Foley et al., 2005; Hanski, 2005). This scenario has been particularly serious for species-rich countries, where negative impacts of agriculture and human population growth have been profound (Pimm et al., 1995; Engelman et al., 2000).

Research on human dominated landscapes has increased in the last decades (Karanth and DeFries, 2010). However, most studies focused on temperate regions and sought to understand the ecology of remnants of natural habitat (Stouffer and Bierregaard, 1995; Estrada et al., 1997; Beier et al., 2002). As a result, our understanding of human dominated landscapes where natural habitats have been drastically reduced or completely extirpated is limited. In order to enhance the biological value of such landscapes, it is critical to understand their associated ecological patterns and processes (MacGregor-Fors et al., 2009; Martin and Possingham, 2005). In particular, birds have been widely used as a study group within human dominated landscapes, as they quickly respond to habitat alteration at different scales (Furness and Greenwood 1993), are sensitive to human related disturbances (Fisher and Peterson, 1997), and exhibit specific habitat preferences for sites with distinct disturbance levels (Ortega-Álvarez and MacGregor-Fors, 2009).

In general, anthropogenic habitats that constitute human dominated landscapes exhibit less diverse and more dominated bird communities than natural habitats (McKay, 1980). Nevertheless, bird community responses to distinct anthropogenic habitats (e.g., crop fields, cattle grazing lands, urban settlements) are not completely understood, as current studies have reported contradictory results. For example, crop fields do not always exhibit more diverse and complex bird communities than cattle grazing lands as suggested by Morris (2000), as this pattern could vary in relation to the remaining vegetation structure and the location of cattle grazing lands across the landscape (Estrada et al., 1997; MacGregor-Fors and Schondube, 2011). Moreover, urbanization is not consistently more negative for birds than agricultural lands (McKay, 1980; Bellocq et al., 2008), as certain cultivation practices could be more detrimental for bird communities than urban development itself (Petit et al., 1999; Faggi et al., 2008). Finally, although riparian habitats have been

highlighted as crucial for wildlife species (Naiman et al., 1993; Woinarski et al., 2000; Sabo et al., 2005), little is known about their importance for bird communities within extremely human-altered landscapes.

In this study, we determined variations in bird communities among anthropogenic and riparian habitats within a highly human-modified Neotropical landscape. For this, we assessed differences in bird community species richness, abundance, structure, and composition (both taxonomic and functional) among crop fields, cattle grazing lands, urban settlements, and riparian habitats in northwestern Colombia. Also, we investigated the similarities of surveyed habitats according to species habitat preferences. According to their vegetation structure, we predicted that riparian habitats would exhibit the richest, most even, and most complex bird communities among all surveyed habitats, followed by cattle grazing lands and crop fields. We expected urban settlements to exhibit the highest bird abundances due to thriving urban exploiter species within these particular habitats. Finally, we presumed that riparian habitats and urban settlements would exhibit unique bird communities according to species habitat preferences, as the former would be more often used by interior forest species, while generalist and disturbed-site species would heavily prefer the latter.

Materials and methods

Study site. Colombia is one of the richest countries in the world for bird species. However, almost 32% of its surface has been transformed into agricultural land, thus posing a serious threat for wildlife (Etter, 1993). This research was carried out in the montane region of San Jerónimo, Cordoba State, in the Caribbean region of Colombia. The study site is characterized by a biota with Chocoanic-Amazonic-Magdalenic affinity (Hernández-Camacho et al., 1992). The original vegetation type of the region included tropical dry forests; however, this original landscape has been drastically altered since the middle of the last century, mainly for agricultural, logging, and through urbanization (Etter, 1993; Henao-Sarmiento et al., 2008). As a result, there has been an important decline in bird diversity in the region (Laurence and Bierregaard, 1997; Renjifo et al., 2000).

Avian surveys. We surveyed resident bird communities from June to July 2010 during peak bird activity (i. e., 06-10h), using 5-min unlimited-radius point-counts (*sensu* Ralph et al., 1996; Huff et al., 2000). We were careful when defining the location of point-counts and when performing bird surveys in order to avoid registering species using different habitats from those that we were actively surveying. We focused our study on resident

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