Landscape and Urban Planning 101 (2011) 1–10

Contents lists available at ScienceDirect

Landscape and Urban Planning

journal homepage: www.elsevier.com/locate/landurbplan

Review

Dusting-off the file: A review of knowledge on urban ornithology in Latin America

Rubén Ortega-Álvarez [a], Ian MacGregor-Fors [b,*]

[a] Laboratorio de Ecología de Restauración, Centro de Investigaciones en Ecosistemas, Universidad Nacional Autónoma de México, Campus Morelia, Antigua Carretera a Pátzcuaro 8701, Morelia 58190, Michoacán, Mexico
[b] Laboratorio de Ecología Funcional, Centro de Investigaciones en Ecosistemas, Universidad Nacional Autónoma de México, Campus Morelia, Antigua Carretera a Pátzcuaro 8701, Morelia 58190, Michoacán, Mexico

ARTICLE INFO

Article history:
Received 24 August 2010
Received in revised form
29 November 2010
Accepted 3 December 2010
Available online 15 February 2011

Keywords:
Avian
Bird
City
Neotropics
Urbanization
Urban ecology

ABSTRACT

The accelerated rate of urban growth has become of major environmental concern, especially in less developed countries where urban development is expected to rise. Although urban ornithological studies from Latin America have increased in the last decades, they have not been previously synthesized. In this review we gathered all the available information regarding urban bird studies from the American continent, excluding the US, Canada, and Alaska, summarized their results, compared them with previous knowledge from other tropical and temperate zones, and discuss possible future urban ornithological trends. We compiled a total of 84 papers published in different languages and journals from 1974 to 2009. Several main urban ornithological patterns reported in the gathered set of publications agree with those previously reported in studies performed in other tropical and temperate zones. However, others differ greatly, and/or cannot be compared due to the lack of information from urban Latin America. We believe that urban ornithology is a promising field in Latin America, as there is still an important amount of missing knowledge that should be considered in order to strengthen generalized urban ornithological and ecological basis. The latter could aid in the development of urban management, conservation, and planning strategies that could result in the establishment of sustainable cities in Latin America.

Contents

* Corresponding author. Current address: Instituto de Ecología, A.C. Carretera antigua a Coatepec 351, El Haya, Xalapa 91070, Veracruz, México. Tel.: +52 228 8421947; fax: +52 443 222777.
E-mail addresses: rubenortega.al@gmail.com (R. Ortega-Álvarez), ian.macgregor@inecol.edu.mx (I. MacGregor-Fors).

0169-2046/$ – see front matter © 2011 Elsevier B.V. All rights reserved.
doi:10.1016/j.landurbplan.2010.12.020

1. Introduction

In the last few decades, the exponential growth of urban areas has become of major environmental concern worldwide (Niemelä, 1999; Grimm et al., 2000; McKinney, 2002). Fast-growing human populations have derived in the uncontrolled expansion of urban areas and the creation of new human settlements, representing a threat for biodiversity and often reducing human welfare (Folke et al., 1997; Alberti, 2005). Urban development is expected to increase dramatically in less developed regions of the world (e.g., Asia, Africa, Latin America) over the following decades. In particular, emergent urban-related conflicts of extreme poverty and abandonment of agricultural activities have been forecast for Latin America, where since the 1980s, >60% of the human population lives within urban systems (Montgomery, 2008; United Nations, 2008). As tropical areas shelter the highest levels of biodiversity in contrast with low-quality urban life, the urbanization tendency in developing tropical countries should receive special attention (Fisher and Christopher, 2007; Sodhi, 2008). Thus, urban ecological studies have gained importance, not only in advancing our understanding of the ecological processes associated with urban systems, but as means to provide urban management and planning recommendations that could mitigate the detrimental effects of urban development (Alberti et al., 2003; Turner, 2003; Evans et al., 2009).

Urban studies have paid special attention to effects on animals (McKinney, 2008), and bird communities in particular have been extensively studied in cities because they: (1) are the only group of vertebrates with complex communities along urban systems (Blair, 1999), (2) can be found throughout cities (Turner, 2003; Crooks et al., 2004; Simon et al., 2007), (3) respond to human mediated disturbances (Fisher and Peterson, 1977), (4) are generally conspicuous and easy to survey (Ralph et al., 1996), and (5) respond to different levels of urban development (Blair, 1999; Ortega-Álvarez and MacGregor-Fors, 2009). Although intermediate levels of urbanization can often lead to high species richness within cities (Blair, 1996; Lepczyk et al., 2008), urban bird studies have mainly demonstrated detrimental effects of urban development on bird community species richness, structure, and/or composition (Emlen, 1974; Beissinger and Osborne, 1982; Clergeau et al., 1998; McKinney, 2002; Melles et al., 2003; Ortega-Álvarez and MacGregor-Fors, 2009, among others). In general, few avian species are actually benefited by urban development and its associated resources and conditions (Shochat, 2004; Robb et al., 2008), which can result in the biotic homogenization of urban avifaunas (Lockwood et al., 2000; Blair, 2001; Clergeau et al., 2006; McKinney, 2006; Devictor et al., 2007; Sorace and Gustin, 2008).

Although urban ornithology is a fast-growing discipline, research has been heavily biased to birds of temperate, upland forests from the US, Canada, and Europe (referred as temperate zones hereafter) (Marzluff et al., 2001; Chace and Walsh, 2006). Urban bird studies from Latin America, starting in the 1970s with Fonaroff's (1974) pioneer publication, have been published constantly over the past decades. However, there is still a sense of lacking knowledge of urban avian ecology in Latin America (MacGregor-Fors, 2008; Perepelizin and Faggi, 2009; Villegas and Garitano-Zavala, 2010). In this review, we compiled all the information available on urban bird studies in the American continent, excluding the US, Canada, and Alaska. Although the term "Latin American" does not officially include all countries in the Americas, we use the term Latin America in this review to include Mexico, all Caribbean countries, and Central and South American countries. We analyzed the existence of ecological patterns among the compiled studies, and compared them with previous knowledge from other tropical areas and the vast set of publications from temperate zones. Finally, we describe the current state of urban ecology knowledge from Latin American countries and pinpoint their major contributions, which could be considered to complement some global urban ecology patterns.

2. Materials and methods

We performed an intensive search of published urban ornithological studies carried out in Latin American human settlements. In order to gather the largest number of papers, regardless of the language of publication or journal indexing, we searched for all possible published papers in different academic databases (e.g., Web of Science, Current Contents Connect, Biological Abstracts, Zoological Record, Google Scholar). We searched for publications using "urban" and "bird" as keywords combined with the names of the countries and dependencies from Latin America (i.e., "urban" AND "bird" AND "Colombia"). In total, we sought for urban ornithology papers from 47 countries: Argentina, Belize, Bolivia, Brazil, Chile, Colombia, Costa Rica, Ecuador, El Salvador, Guatemala, Guiana, French Guiana, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, Suriname, Uruguay, Venezuela, Anguilla, Antigua and Barbuda, Aruba, Bahamas, Barbados, Bermuda, British Virgin Islands, Cayman Islands, Cuba, Dominica, Dominican Republic, Grenada, Guadeloupe, Haiti, Jamaica, Martinique, Montserrat, Netherlands Antilles, Puerto Rico, Saint Barthélemy, Saint Kitts and Nevis, Saint Lucia, Saint Martin, Saint Vincent and the Grenadines, Trinidad and Tobago, and Turks and Caicos Islands. The acquired sets of papers were classified by country, year published, general topic, and language.

3. Results

Our search allowed us to gather 84 urban ornithology papers, starting with Fonaroff's (1974) study of urban birds from Port-of-Spain, Trinidad and Tobago. These comprise ~5% of the more than 1500 papers on urban ornithology published worldwide since Pitelka's (1942) study. In this sense, urban ornithology research in Latin America has a ~30 year-lag in relation to research developed in temperate zones. Although urban ornithology has considerably increased in the last three decades worldwide, this topic started receiving special attention in Latin America only recently.

The gathered publications were developed in 12 of the 47 Latin American countries. Among countries, the number of studies varied widely, with Brazil, Argentina, and Mexico leading the publication rate (79% of the total gathered publications; Fig. 1). Despite the fact that urban bird research in Latin America began in the 1970s, only 14% of the papers were carried out during the 20th century. Three main topics were identified from the set of publications: (1)

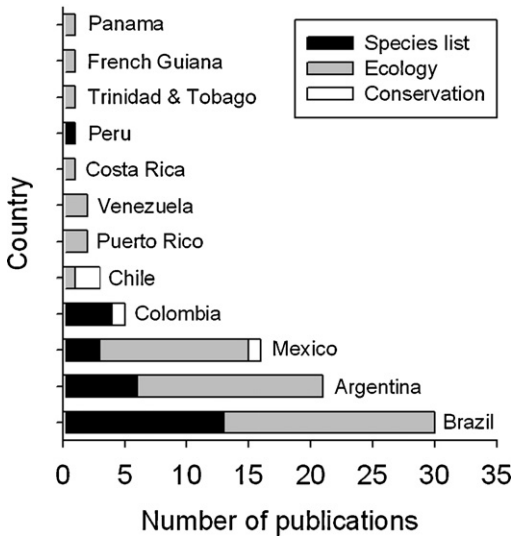

Fig. 1. Number of published studies on urban ornithology in Latin America by country and main subject area.

ecological patterns (63%), (2) lists of bird species at specific locations (32%), and (3) biological conservation (5%). Of the 84 urban ornithology papers, 60% were written in local languages (i.e., Spanish, Portuguese), and 40% in English.

3.1. Species lists

Species lists comprised 32% of the gathered Latin American urban bird studies, and were mainly carried out in Brazil, Mexico, Argentina, Colombia, and Peru. In general, species lists have been used to describe the composition of bird communities in specific urban and rural areas (Naranjo and Estela, 1999; Fontana, 2005; Torga et al., 2007; Tampson and Petry, 2008), and within particular urban land-uses, such as: (1) residential areas (Argel de Oliveira, 1995; Soares, 2004), (2) urban parks (de Lima and Aleixo, 2000; Scherer et al., 2005; Gómez, 2006; Valadão et al., 2006), (3) urban gardens (de Lima and Aleixo, 2000), and (4) University campuses (Montaldo and Claver, 1996; Maceda and Kin, 2001; Cupul-Magaña, 2003; MacGregor-Fors, 2005; Marín-Gómez, 2005; Muñoz et al., 2007; Takano-Goshima and Castro-Izaguirre, 2007; Ramírez-Albores, 2008). Moreover, a vast array of natural habitats embedded within Latin American urban areas have been assessed: (1) beaches (Vinhola da Silva, 2003; Acosta-Ramos and Batista-Daudt, 2005; Faggi et al., 2010), (2) lakes (Silva and Blamires, 2007), (3) secondary vegetation patches (Rivera-Gutierrez, 2006; Vinhola da Silva, 2006), and (4) remnants of primary urban forests (Monnerat-Nogueira et al., 2005).

Species lists report up to 160 species comprising urban bird communities (i.e., Porto Alegre, Brazil; Fontana, 2005). The main taxonomic bird families reported in these studies are Emberizidae and Tyrannidae (Acosta-Ramos and Batista-Daudt, 2005; Torga et al., 2007), followed by Fringillidae, Thraupidae, and Parullidae (Marín-Gómez, 2005; Rivera-Gutierrez, 2006), and in some cases Columbidae and Psittacidae (Takano-Goshima and Castro-Izaguirre, 2007). Additionally, it is important to denote that exotic species, incorporated through human-related introductions and/or cage-bird escapes, play an important role in the composition of urban bird communities within Latin American urban systems (Montaldo and López, 1992; MacGregor-Fors, 2004; Fontana, 2005; Valdés-Peña and Gozalez-Rojas, 2006).

Trophic groups and nesting guilds were assessed in some of the reviewed species lists, with omnivore, granivore, and insectivore species predominating (Argel de Oliveira, 1995; MacGregor-Fors, 2005; Scherer et al., 2005; Valadão et al., 2006; Vinhola da Silva, 2006; Muñoz et al., 2007; Silva and Blamires, 2007; Torga et al., 2007; Tampson and Petry, 2008), while piscivore and scavenger species were generally underrepresented (Scherer et al., 2005). Among the identified nesting guilds, tree and shrub nesting species seemed to be prevalent among Latin American settlements (Argel de Oliveira, 1995; Maragliano et al., 2009).

3.2. Ecological studies

Although not rigorously represented in previous reviews, the ecological effects of urbanization on Latin American urban birds have been widely addressed, receiving greater attention in Brazil, Argentina, and Mexico, with a lesser representation of published papers in Puerto Rico, Venezuela, Costa Rica, Trinidad and Tobago, Panama, Chile, and the French Guiana (Fig. 1). In general, urban ornithological studies in Latin America have focused on: (1) urban gradients (Reynaud and Thioulouse, 2000; Leveau and Leveau, 2004, 2005; Juri and Chani, 2005; Faggi et al., 2006; Faggi and Perepelizin, 2006; Bellocq et al., 2008; Petry and Scherer, 2008; Garaffa et al., 2009; López-Flores et al., 2009; Ortega-Álvarez and MacGregor-Fors, 2009), (2) community comparisons among different urban habitats (Petit et al., 1999; Borges and Guilherme, 2000; Caula et al., 2003; Lucero et al., 2005; Manhães and Loures-Ribeiro, 2005; Faggi and Perepelizin, 2006; Galina and Gimenes, 2006; Lopes and dos Anjos, 2006; Eduardo et al., 2007; Acevedo and Aide, 2008; Cardozo et al., 2008; MacGregor-Fors et al., 2009a; Ortega-Álvarez and MacGregor-Fors, 2009), (3) bird responses to urban habitat attributes (Leveau and Leveau, 2004, 2006; Faggi and Perepelizin, 2006; MacGregor-Fors, 2008; MacGregor-Fors et al., 2009a; Ortega-Álvarez and MacGregor-Fors, 2009; Suarez-Rubio and Thomlinson, 2009), (4) use of resources by birds within urban systems (Marcondes-Machado et al., 1994; Alves and Pereira, 1998; de Vasconcelos, 1998; Vitali-Veiga and Machado, 2000; Cáceres and Moura, 2003; Baza-Mendonça and dos Anjos, 2006; Valdés-Peña and Gozalez-Rojas, 2006; Zulma et al., 2006; Arizmendi et al., 2007, 2008; Guix, 2007; Sazima and Sazima, 2007; Leveau, 2008; San Martín-Órdenes, 2009), (5) specific threats imposed by urbanization to birds (Fonaroff, 1974; Stiles, 1990; Villanueva-Villanueva and da Silva, 1995; Escofet and Espejel, 1999; Borges and Guilherme, 2000; Serrano do Nascimento et al., 2005; Eduardo et al., 2007; Rodríguez-Estrella, 2007; López-Flores et al., 2009), and (6) urban bird ethology (Levin et al., 2000; Pinheiro, 2003; Echeverría et al., 2006; Echeverría and Vassallo, 2008). As a result, different urban management and planning activities have been proposed to reduce the negative effects that urban development can have on urban-dwelling birds in Latin America (Reynaud and Thioulouse, 2000; Caula et al., 2003; MacGregor-Fors, 2008; López-Flores et al., 2009; MacGregor-Fors et al., 2009a; Ortega-Álvarez and MacGregor-Fors, 2009; Suarez-Rubio and Thomlinson, 2009).

3.2.1. Urban gradients

Bird community responses to different levels of urban development have been widely explored in Latin American settlements. As a general pattern, bird species richness declines as urban development increases, while maximum bird abundances peak with greater extent of urbanization (Leveau and Leveau, 2004, 2005; Faggi et al., 2006; Petry and Scherer, 2008; Garaffa et al., 2009; Ortega-Álvarez and MacGregor-Fors, 2009). Garaffa et al. (2009) showed that this pattern responds to the size of human settlements. However, Faggi and Perepelizin (2006) recorded highest bird species richness at both extremes of an urbanization gradient in Argentina, which responded to the quality and heterogeneity of the surrounding habitats (e.g., water availability, influence of riverine corridors, heterogeneity of urban parks). Furthermore, highly developed urban areas lead to: (1) taxonomic and func-

tional homogenization of urban bird communities (Ortega-Álvarez and MacGregor-Fors, 2009), (2) dominated communities (Reynaud and Thioulouse, 2000; Petry and Scherer, 2008; Ortega-Álvarez and MacGregor-Fors, 2009), (3) the reduction of ground-dwelling species (Leveau and Leveau, 2004, 2005), (4) increases of high tree-stratum-dwelling species (Juri and Chani, 2005; MacGregor-Fors, 2008), and (5) rises in exotic species population numbers (Leveau and Leveau, 2004; Juri and Chani, 2005; Ortega-Álvarez and MacGregor-Fors, 2009).

3.2.2. Comparisons among urban habitats

Different results have emerged from the comparison of bird communities among Latin American urban habitats. Although natural habitats surrounding cities tend to comprise richer bird communities (Borges and Guilherme, 2000; Eduardo et al., 2007), the incorporation of green areas within the urban matrix offers suitable habitat for an important number of bird species (MacGregor-Fors et al., 2009a; Ortega-Álvarez and MacGregor-Fors, 2009). Specifically, urban parks and natural vegetation remnants within cities have an enormous ecological value for urban systems, as they represent the urban land-uses with highest bird diversity (Faggi and Perepelizin, 2006; Galina and Gimenes, 2006; Lopes and dos Anjos, 2006; Acevedo and Aide, 2008; Cardozo et al., 2008; Ortega-Álvarez and MacGregor-Fors, 2009). However, their size, habitat heterogeneity, and vegetation characteristics (e.g., number of vegetation strata, tree cover, maximum tree height) often determine the structure and composition of bird communities (Caula et al., 2003; Lucero et al., 2005; Manhães and Loures-Ribeiro, 2005; Galina and Gimenes, 2006; MacGregor-Fors, 2008).

3.2.3. Responses to urban attributes

Particular landscape and site-specific urban attributes within Latin American cities have been proven to directly affect bird communities (Leveau and Leveau, 2006; MacGregor-Fors et al., 2009a). Landscape attributes such as proximity to roads and water bodies, patch size, and level of development of the urban matrix, have been related to bird species richness, which may differ between native and exotic species (Faggi and Perepelizin, 2006; Suarez-Rubio and Thomlinson, 2009). Several site-specific attributes have also been identified as crucial in shaping bird diversity within urban Latin America: (1) vegetation characteristics (Leveau and Leveau, 2004; Faggi and Perepelizin, 2006; MacGregor-Fors, 2008; Ortega-Álvarez and MacGregor-Fors, 2009); (2) human activities (Ortega-Álvarez and MacGregor-Fors, 2009); and (3) urban infrastructure (Leveau and Leveau, 2004).

3.2.4. Use of resources

Urban bird ecologists have shown particular interest in identifying the resources used by birds within Latin American cities. In particular, the vegetation component has been identified as crucial for multiple species within urban settings (MacGregor-Fors et al., 2009a). In this way, urban trees offer perching, preening, foraging, and nesting sites for both native and exotic bird species (de Vasconcelos, 1998; Valdés-Peña and Gozalez-Rojas, 2006; Sazima and Sazima, 2007; San Martín-Órdenes, 2009). Shrubs also represent important hiding and feeding sites for many bird species (Vitali-Veiga and Machado, 2000). Additionally, Latin American cities harbor diverse energy-rich plant species, both native and exotic, which often attract numerous nectarivore, frugivore, and omnivore bird species (Cáceres and Moura, 2003; Baza-Mendonça and dos Anjos, 2006; Guix, 2007; Leveau, 2008). Finally, the array of resources and conditions directly provided by people (e.g., nest boxes, feeders) play an important role in determining the abundance of several bird species (Marcondes-Machado et al., 1994; Arizmendi et al., 2007). For example, nest-boxes afford protection against anthropogenic disturbance and high predation rates (López-Flores et al., 2009), facilitating the establishment of cavity-nesting species in urbanized areas (Marcondes-Machado et al., 1994). Also, hummingbirds benefit from nectar feeders within neotropical cities despite their negative effects on native hummingbird-pollinated plants (Arizmendi et al., 2007, 2008).

3.2.5. Specific threats imposed by urbanization

Urban sprawling in Latin America has caused the modification of original avifaunas (Fonaroff, 1974; Stiles, 1990; Villanueva-Villanueva and da Silva, 1995). As Latin American cities develop, land-uses change and habitat fragmentation increases, severely threatening native bird species (Borges and Guilherme, 2000; Serrano do Nascimento et al., 2005; Eduardo et al., 2007; Rodríguez-Estrella, 2007; Ortega-Álvarez and MacGregor-Fors, 2009). In particular, urban development has been associated with high nest predation rates (López-Flores et al., 2009), and decreases in avian reproductive and foraging activities (Escofet and Espejel, 1999). Nevertheless, results of a recent study show that bird responses to urbanization are species-dependent (Rodríguez-Estrella, 2007). In this way, the novel habitats generated by urbanization can detrimentally affect or benefit species under particular circumstances (MacGregor-Fors et al., 2008). To this extent, species associated with open habitats have higher capability of dwelling in highly developed urban environments than forest species (Fonaroff, 1974; Stiles, 1990). In addition, exotic, generalist, granivore, insectivore, and large-sized bird species tend to be favored by urbanization in Latin America (Villanueva-Villanueva and da Silva, 1995; Leveau and Leveau, 2006; Eduardo et al., 2007; González-Oreja et al., 2007; MacGregor-Fors, 2008).

3.2.6. Ethology

Few studies have focused on bird ethology within Latin American cities, but those that do have presented interesting results. Levin et al. (2000) observed that bird species arrive to feeding sites in a non-random order, in such a way that dominant species drop in at second place, probably to reduce the potential predation risk imposed by urban predators. Leveau (2008) also recorded that House Sparrows (*Passer domesticus*) alter their visiting rate to nectar-rich plants in relation to changes in human activity patterns and to the distribution of plants. Echeverría et al. (2006) and Echeverría and Vassallo (2008) found that the presence of alien objects near feeding stations reduced feeding visitation rates to an otherwise attractive food source. Finally, Pinheiro (2003) evaluated the discriminatory behavior of birds to mimetic and non-mimetic butterflies among natural and urban habitats, concluding that discriminatory behavior is determined by the habitat in which birds live. Hence, these studies show that urbanization causes important selective pressures to urban-dwelling bird species, which often result in the alteration of their behavior (Spescha et al., 2004).

3.2.7. Urban management and planning activities

Different urban management and planning activities have been proposed in Latin American studies. For instance, bird monitoring programs have been recommended to evaluate habitat quality of urban systems, using either community-based or species-based approaches (Reynaud and Thioulouse, 2000; MacGregor-Fors et al., 2009a; Ortega-Álvarez and MacGregor-Fors, 2009; Suarez-Rubio and Thomlinson, 2009). Specific activities have also been suggested to maintain and/or increase the ecological quality within cities, and thus enhance urban native bird diversity by: (1) preserving natural habitat remnants within cities (Caula et al., 2003), (2) promoting forest patches within urban systems (Suarez-Rubio and Thomlinson, 2009), (3) regulating land-use changes, (4) increasing urban vegetation quality and quantity, (5) generat-

ing urban green networks, and (6) developing citizen educational programs in urban systems (reviewed in MacGregor-Fors et al., 2009a).

3.3. Conservation

Among the reviewed publications, only four papers from Mexico ($n = 1$), Colombia ($n = 1$), and Chile ($n = 2$), focused on biological conservation perspectives. In Mexico, Mellink and Riojas-López (2009) analyzed how urban associated processes (i.e., waste plumbing) affect waterbird species that dwell in urban related water bodies. In Colombia, Vásquez-Muñoz and Castaño-Villa (2008) identified urban parks as important for birds, reducing bird species loss caused by urbanization. They also propose domestic species management and restoration activities within urban parks to increase habitat suitability for birds within urban green areas. In Chile, Arango et al. (2007) evaluated citizens' preferences for bird species in order to identify charismatic species useful to promote the conservation of forests threatened by urban sprawl. Beyond its ecological and socioeconomic value, the Magellanic Woodpecker (*Campephilus magellanicus*) was underlined as a charismatic species, as it is well known, highly aesthetic, and culturally important for the local community. Finally, Pauchard et al. (2006) pinpointed the effect that urbanization has on biodiversity in Concepción (Chile), stating that the sprawling of the city has affected birds due to the reduction of habitat complexity of native wetland plant communities.

4. Discussions and conclusions

Urban ornithology in Latin America is a growing discipline. However, it remains poorly studied when compared to the vast array of knowledge generated in temperate zones. As Latin American urban areas have particular biological, physical, and cultural characteristics, the description and evaluation of their urban ornithological trends could result in the consolidation of generalized urban ornithological patterns. In fact, many of the ecological patterns recorded in Latin American settlements agree with those found in other tropical and temperate zones. In this section, we first focus on the similarities and differences between the set of publications from Latin America and those carried out in temperate zones (Marzluff et al., 2001; Chace and Walsh, 2006; Evans et al., 2009, and references therein), and other tropical regions (i.e., Australia, Asia, Africa). We also compare urban management and planning activities proposed in Latin American studies and those derived from studies performed in other regions of the world. Finally, we highlight topics that are still lacking in the current Latin American urban ornithology literature.

4.1. Species lists

In contrast to the array of urban ornithological studies performed in temperate zones, species lists are abundant in the Latin American urban ornithology literature. This seems to be related to the lack of knowledge on the accurate distribution of bird species, including those that dwell within urban settlements. Thus, the description of local urban avifaunas represents the first step in generating an ornithological database from which to properly address specific ecological questions.

One of the most remarkable differences between Latin American and temperate urban areas is the number of species that comprise urban bird communities, with Latin American cities usually having richer avian communities. This is not surprising, as Latin America is the region with the highest number of bird species worldwide (Fisher and Peterson, 1977). The taxonomic composition of bird communities also varied greatly among regions, with Tyrannidae, Thraupidae, and Psittacidae (characteristic of the tropical areas) well represented in many Latin American cities (Rivera-Gutierrez, 2006; Muñoz et al., 2007; Takano-Goshima and Castro-Izaguirre, 2007), while they are rare and/or exotic in temperate urban areas (Bull, 1971; VanBael and Pruett-Jones, 1996; Sol et al., 1997; Burger and Gochfeld, 2009). Interestingly, corvids have been reported as highly successful urban-dwelling birds in temperate zones and other tropical regions of the world (Chace and Walsh, 2006; Lim and Sodhi, 2009), but are uncommon within the reviewed Latin America urbanized areas.

Trophic guild responses to urban development are fairly similar in Latin American and temperate zones, but markedly different in relation to those from other tropical regions. In general, granivore, omnivore, and insectivore species are benefited by urbanization in Latin America and temperate zones (Emlen, 1974; Argel de Oliveira, 1995; MacGregor-Fors, 2005, 2008; Scherer et al., 2005; Chace and Walsh, 2006; Silva and Blamires, 2007; Evans et al., 2009; Maragliano et al., 2009). Although granivore and omnivore species are also benefited by urbanization in other tropical areas, insectivores are not (i.e., Singapore; Lim and Sodhi, 2004). Another difference among Latin American cities and other tropical urban areas relies in the dominance of nectarivore species. In Latin America, hummingbirds and other facultative nectarivores (e.g., icterids, warblers) represent an abundant, yet not dominant, component of urban bird communities (Baza-Mendonça and dos Anjos, 2006; Torga et al., 2007; Arizmendi et al., 2008). However, recent studies have determined the dominant role of nectarivores in Australian urban bird communities (French et al., 2005; Young et al., 2007).

4.2. Ecological studies

4.2.1. Urban gradients

The general effect of urbanization on bird communities is consistent among temperate zones, Latin America, and other tropical regions, with native species richness declining and total bird abundance increasing with urban development (Emlen, 1974; Leveau and Leveau, 2004; Shochat, 2004; Chace and Walsh, 2006; Petry and Scherer, 2008; Ortega-Álvarez and MacGregor-Fors, 2009; van Rensburg et al., 2009). Remarkably, the intermediate disturbance pattern in urban areas, showing highest bird species richness in moderate levels of urbanization, has only been recorded in temperate zones (McDonnell et al., 1993; Blair, 1996; Lepczyk et al., 2008; Evans et al., 2009).

Similar to that recorded in temperate zones, urbanization leads to the taxonomic homogenization of birds communities within Latin American and other tropical cities (Lockwood et al., 2000; Ortega-Álvarez and MacGregor-Fors, 2009; van Rensburg et al., 2009). However, the functional homogenization of bird communities is not prevalent among all Latin American urban systems, as Scherer et al. (2005) noted that urbanization and natural habitat fragmentation did not alter the trophic structure of urban park bird communities in Porto Alegre (Brazil).

Another generalized pattern among tropical and temperate areas from around the world, including Latin America, reveals that increases in total bird abundances at highest levels of urban development tend to be an artifact of urban exploiter species, often exotic. In fact, Ortega-Álvarez and MacGregor-Fors (2009) report that the abundance of dominant urban-exploiter species can bias analyses when considering total bird abundance. Nevertheless, bird species that dominate communities vary between geographic regions, as House Sparrows and Rock Pigeons (*Columba livia*) usually dominate temperate, Latin American, and other Asiatic urban bird communities (Lim and Sodhi, 2004; Juri and Chani, 2005; Ortega-Álvarez and MacGregor-Fors, 2009), while other species (e.g., Common Mynas—*Acridotheres tristis*) are dominant in other specific areas (van Rensburg et al., 2009).

4.2.2. Comparisons among urban habitats

Green areas have been identified as crucial for native urban-dwelling species in temperate zones, Latin America, and other tropical regions, however their role depends on their characteristics (Faggi and Ignatieva, 2009). Latin American urban parks often represent fairly similar habitat structure in relation to that of natural habitats, leading to species-rich urban-dwelling bird communities (Scherer et al., 2005). Within tropical regions, natural habitat remnants within University campuses have been identified as crucial for maintaining species-rich bird communities (Lopes and dos Anjos, 2006), including both endemic and endangered species (Vallejo et al., 2009).

4.2.3. Responses to urban attributes

Within Latin America, both landscape and site-specific urban attributes have been identified as important in determining bird species richness (Leveau and Leveau, 2004; Faggi and Perepelizin, 2006; Suarez-Rubio and Thomlinson, 2009). However, in temperate zones and other tropical regions (i.e., Australia), the relative magnitude of the effects that landscape attributes have on bird diversity is negligible compared to that of site-specific attributes (Clergeau et al., 2001; Daniels and Kirkpatrick, 2006; Young et al., 2007; Evans et al., 2009). According to site-specific urban attributes, native, mature, and structurally diverse vegetation, less built-cover, and low abundance of exotic species, have been positively associated with native bird species richness and abundance within all regions (Munyenyembe et al., 1989; Lim and Sodhi, 2004; Chace and Walsh, 2006; Husté et al., 2006; Parsons et al., 2006; Murgui, 2007; Evans et al., 2009; Kath et al., 2009; Ortega-Álvarez and MacGregor-Fors, 2009). Nevertheless, different site-specific attributes are important for bird diversity among regions of the world with reduced non-consumptive human activities being positively correlated with bird species richness in temperate and Latin American cities (Chace and Walsh, 2006; Ortega-Álvarez and MacGregor-Fors, 2009), while low abundance of aggressive competitors has been identified as crucial for maintaining high native bird diversity in tropical regions other than Latin American (i.e., Australia; Parsons et al., 2006; Kath et al., 2009).

4.2.4. Use of resources

Comparisons among bio-regions regarding the use of resources by birds in urban areas are difficult to establish due to the different foci used to assess resources. In Latin America, particular attention has been paid to the evaluation of the role that urban vegetation has on urban-dwelling bird species, mainly as food sources (Vitali-Veiga and Machado, 2000; Cáceres and Moura, 2003; Baza-Mendonça and dos Anjos, 2006; Guix, 2007; Leveau, 2008; San Martín-Órdenes, 2009). In temperate zones, the use of resources by birds has been thoroughly addressed by ecologists, especially regarding the effects that direct and indirect food provisioning by humans have on the demographic parameters of some bird populations (Marzluff et al., 2001; Chace and Walsh, 2006; Robb et al., 2008; Evans et al., 2009). Studies performed in tropical regions other than Latin America have focused on the importance of bird activities for the input of nutrients in urban forests (Fujita and Koike, 2009), habitat preferences and home ranges of corvids (Lim and Sodhi, 2009), food resources used by birds in gardens and street trees (French et al., 2005; Daniels and Kirkpatrick, 2006; Young et al., 2007), and relationships between human-related food supplies and the mass and body condition of urban-dwelling gulls (Auman et al., 2008). Despite the fact that these studies assess the use of resources from different perspectives, the general conclusion points to urban vegetation components as crucial feeding, roosting, perching, and nesting resources.

4.2.5. Specific threats imposed by urbanization

There is a generalized pattern in the urban attributes that negatively impact birds, with buildings, power-lines, human activities, traffic, and aggressive ecological competitors being the major threats for urban birds within temperate, Latin American, and other tropical cities (Cupul-Magaña, 2003; Leveau and Leveau, 2004; Chace and Walsh, 2006; Parsons et al., 2006; Young et al., 2007; Kath et al., 2009; Ortega-Álvarez and MacGregor-Fors, 2009). However, the relative magnitude of the effects that these variables can have on bird communities differs greatly among species and communities. For example, a recent study carried out in Mexico City shows that the effects of different urban habitat traits and hazards are species-dependent, with urban-exploiter species benefiting from urban structures and human activities, and less urban-tolerant species being positively related to vegetation components and negatively related to the number of potential predators (Ortega-Álvarez and MacGregor-Fors, 2010). Regarding aggressive ecological competitors, it is important to consider the existence of local differences in the composition of urban avifaunas among regions of the world, as their identity varies among urban systems (e.g., House Sparrow and Bronzed Cowbird [*Molothrus aeneus*] within temperate zones and Latin America [Gowaty, 1984; MacGregor-Fors et al., 2010]; Common myna, Pied Currawong [*Strepera graculina*] and Noisy Miner [*Manorina melanocephala*] in Australia [Major et al., 1996; Parsons et al., 2006; Kath et al., 2009]; and House Crow [*Corvus splendens*] in Asia [Brooks et al., 2003]).

Bird species favored by urbanization differ among regions, depending on the set of species present in nearby habitats (Croci et al., 2008), and their potential as non-exotic invaders (MacGregor-Fors et al., 2009b). Although omnivorous birds are usually successful in highly developed urban areas within temperate and Latin America cities (MacGregor-Fors, 2005; Scherer et al., 2005; Chace and Walsh, 2006; Vinhola da Silva, 2006; Muñoz et al., 2007; Torga et al., 2007; Tampson and Petry, 2008), they are not in other tropical regions (i.e., Singapore; Lim and Sodhi, 2004). Bird species associated with open habitats often find suitable conditions among urban environments in Latin America (Fonaroff, 1974; Stiles, 1990), however they tend to disappear within other tropical urban systems (i.e., South Africa; van Rensburg et al., 2009), and occur in early stages of urban development within temperate zones (Evans et al., 2009). Corvids are not successful urban-dwellers within Latin American cities, but represent important urban-exploiter species in temperate zones and other tropical regions (Marzluff et al., 2001; Soh et al., 2002; Lim and Sodhi, 2004).

4.2.6. Ethology

Bird behavior within urban systems has not received special attention in any particular region of the world. In Latin America, studies have concentrated on bird feeding behavior (Levin et al., 2000; Pinheiro, 2003; Echeverría et al., 2006; Echeverría and Vassallo, 2008). In contrast, studies performed in temperate zones and Australia focus on the behavioral responses of birds to human disturbance and urbanization (Fernández-Juricic et al., 2001; Chace and Walsh, 2006), and compare predator activities between edge and interior urban woodlands (Anderson and Burgin, 2008). However, a broad conclusion can be drawn from the results of these studies: bird behavior is heavily affected by urban development, particularly as a result of predation risk, human activities, and urban features.

4.2.7. Urban management and planning activities

A vast array of urban management and planning activities have been proposed based on the results of ecological studies carried out in urban areas around the world. Of these, regulating land-use change, generating urban green networks, and developing citizen environmental educational programs have been pinpointed as cru-

cial (Marzluff and Ewing, 2001; Tan, 2006; Mason et al., 2007; MacGregor-Fors et al., 2009a). On the one hand, generalized recommendations have arisen from studies performed in temperate and tropical regions, including the establishment of bird monitoring programs as "ecological thermostats", increasing the structural complexity of the urban vegetation component, and the preservation of natural vegetation remnants within cities as urban bird refuges (Caula et al., 2003; Lim and Sodhi, 2004; Evans et al., 2009; MacGregor-Fors et al., 2009a; Ortega-Álvarez and MacGregor-Fors, 2009; van Rensburg et al., 2009). On the other hand, specific urban planning and management activities differ among regions. Thus, although a vast array of urban management and planning activities have been proposed based on ornithological studies performed in the temperate zones, Australia, and several Asian countries, applying them in Latin America could be misleading due to the differences in the ecological bird community patterns found in Latin America and the rest of the world. Hence, more research is required in order to accomplish specific ecological and cultural needs of the different Latin American cities. It is particularly important to generate social, scientific, and governmental processes that consolidate the existent knowledge with actions encouraged to reduce the effect of urbanization on biodiversity and to enhance human welfare (Nilon et al., 2003; Ávila, 2006).

4.3. Conservation

Few studies have focused their conclusions towards the conservation of birds within urban systems. Studies carried out in Latin America have noted the indirect impact of urbanization on birds (Pauchard et al., 2006; Mellink and Riojas-López, 2009), highlighted the importance of urban park characteristics as determinant for urban-dwelling bird communities (Vásquez-Muñoz and Castaño-Villa, 2008), and have incorporated human preferences as a strategy to manage woodland conservation threatened by urban sprawl (Arango et al., 2007). These conservation concerns are somewhat different to those underlined in studies performed in temperate urban areas, which pinpoint the importance of identifying vulnerable species to urbanization (Evans et al., 2009), using bird monitoring as a tool for conservation (Turner, 2003), assessing restoration recommendations for bird conservation within urban systems (Marzluff and Ewing, 2001), and considering gardens as bird reservoirs (Daniels and Kirkpatrick, 2006; Fuller et al., 2008; Evans et al., 2009; Kath et al., 2009).

4.4. Lack of urban studies in Latin America

As recorded in this review, species lists comprise an important proportion of the total urban ornithology studies performed in Latin America. Although these kind of studies establish an important natural history base-line on urban-dwelling bird communities, taking the next step to consolidate the ecological fundamentals of urban ornithology in Latin America is crucial. Studies from a wider selection of Latin American countries would greatly contribute to the understanding of ecological patterns in urban ornithology. Thus, we believe that urban ornithological research is a promising field in Latin America.

Despite the increased rate of publications during the last decades, there is still a dearth of knowledge on Latin American urban ornithology and ecology, which is required to accurately develop urban planning, management, and conservation strategies. When comparing Latin American studies with those from the rest of the world, we identified several topics that deserve further exploration by Latin American ecologists, including demographic patterns, physiological responses, behavioral ecology, exotic–native species–species interactions, biotic homogenization, genetics, and adaptive processes. Furthermore, as underlined by Shochat et al. (2006), future urban ornithology trends should progress from descriptive to mechanistic.

Although a large amount of scientific research on urban ornithology has enabled the comprehension of some of the ecological processes within urban areas in Latin America, there is a gap in perspectives and interests among scientists, policy makers, urban planners/managers, and urban citizens (as recorded for other areas of the world; Hollweg et al., 2003). Since birds are highly charismatic and comprise one of the few well represented wildlife groups within cities, they could provide a unique opportunity to merge scientific, political, and social interests to develop sustainable cities in Latin America.

Acknowledgements

We thank Katherine Renton, Roberto Lindig-Cisneros, and two anonymous reviewers for their valuable comments. Being part of the Posgrado en Ciencias Biológicas of the Universidad Nacional Autónoma de México (UNAM), the authors received a Ph.D. (IM-F) and Master's (RO-A) scholarship from CONACYT (175447 and 327503, respectively).

References

Acevedo, M.A., Aide, T.M., 2008. Bird community dynamics and habitat associations in Karst, Mangrove and Pterocarpus forest fragments in an urban zone in Puerto Rico. Carib. J. Sci. 44, 402–416.

Acosta-Ramos, L., Batista-Daudt, R., 2005. Avifauna urbana dos balneários de Tramandaí e Imbé, litoral norte do Rio Grande do Sul (Urban bird fauna of Tramandaí and Imbé beaches, north coast, Rio Grande do Sul, Brazil). Biotemas 18, 181–191 (in Portuguese).

Alberti, M., Marzluff, J.M., Shulenberger, E., Bradley, G., Ryan, C., Zumbrunnen, C., 2003. Integrating humans into ecology: opportunities and challenges for studying urban ecosystems. Bioscience 53, 1169–1179.

Alberti, M., 2005. The effects of urban patterns on ecosystem function. Int. Reg. Sci. Rev. 28, 168–192.

Alves, M.A.S., Pereira, E.F., 1998. Richness, abundance and seasonality of bird species in a lagoon of an urban area (Lagoa Rodrigo de Freitas) of Rio de Janeiro, Brazil. Ararajuba 6, 110–116.

Anderson, L., Burgin, S., 2008. Patterns of bird predation on reptiles in small woodland remnant edges in peri-urban north-western Sydney, Australia. Landsc. Ecol. 23, 1039–1047.

Arango, X., Rozzi, R., Massardo, F., Anderson, C.B., Ibarra, T., 2007. Descubrimiento e implementación del Pájaro Carpintero Gigante (*Campephilus magellanicus*) como especie carismática: una aproximación biocultural para la conservación en la Reserva de Biósfera de Cabo de Hornos (Discovery and implementation of Magellanic Woodpecker (*Campephilus magellanicus*) as an emblematic species: a biocultural apporach for conservation in Cape Horn Biosphere Reserve). Magallania 35, 71–88 (in Spanish).

Argel de Oliveira, M.M., 1995. Aves e vegetação em um bairro residencial da cidade de São Paulo (São Paulo, Brasil) (Birds and vegetation in a residential quarter in São Paulo City (São Paulo, Brazil)). Rev. Bras. Zool. 12, 81–92 (in Portuguese).

Arizmendi, M., Monterrubio-Solís, C., Juárez, L., Flores-Moreno, I., López-Saut, E., 2007. Effect of the presence of nectar feeders on the breeding success of *Salvia mexicana* and *Salvia fulgens* in a suburban park near Mexico City. Biol. Conserv. 136, 155–158.

Arizmendi, M., López-Saut, E., Monterrubio-Solís, C., Juárez, L., Flores-Moreno, I., Rodríguez-Flores, C., 2008. Efecto de la presencia de bebederos artificiales sobre la diversidad y abundancia de los colibríes y el éxito reproductivo de dos especies de plantas en un parque suburbano de la Ciudad de México (Effect of nectar feeders over diversity and abundance of hummingbirds and breeding success of two plant species in a sub-urban park next to Mexico City). Ornitol. Neotrop. 19, 491–500 (in Spanish).

Auman, H.J., Meathrel, C.E., Richardson, A., 2008. Supersize me: does anthropogenic food change the body condition of Silver Gulls? A comparison between urbanized and remote, non-urbanized areas. Waterbirds 31, 122–126.

Ávila, P., 2006. Hacia la construcción de un marco conceptual para el estudio de la relación ciudad-medio ambiente. In: Tapia, C.E., Vargas Uribe, G. (Eds.), El Impacto del Desarrollo Humano en los Recursos Naturales. CIDEM-UMSNH, Morelia, pp. 17–31 (in Spanish).

Baza-Mendonça, L., dos Anjos, L., 2006. Feeding behavior of hummingbirds and perching birds on *Erythrina speciosa* Andrews (Fabaceae) flowers in an urban area, Londrina, Paraná, Brazil. Rev. Bras. Zool. 23, 42–49.

Beissinger, S.R., Osborne, D.R., 1982. Effects of urbanization on avian community organization. Condor 84, 75–83.

Bellocq, M.I., Filloy, J., Garaffa, P.I., 2008. Influence of agricultural intensity and urbanization on the abundance of the raptor Chimango Caracara (*Milvago chimango*) in the Pampean region of Argentina. Ann. Zool. Fenn. 45, 128–134.

Blair, R.B., 1996. Land use and avian species diversity along an urban gradient. Ecol. Appl. 6, 506–519.
Blair, R.B., 1999. Birds and butterflies along an urban gradient: surrogate taxa for assessing biodiversity? Ecol. Appl. 9, 164–170.
Blair, R.B., 2001. Creating a homogeneous avifauna. In: Marzluff, J.M., Bowman, R., Donnely, R. (Eds.), Avian Conservation and Ecology in an Urbanizing World. Kluwer Academic, Boston, pp. 459–486.
Borges, S.H., Guilherme, E., 2000. Comunidade de aves em um fragmento florestal urbano em Manaus, Amazonas, Brasil (Bird community in an urban forest fragment in Manaus City, Amazonas, Brazil). Ararajuba 8, 17–23 (in Portuguese).
Brooks, B.W., Sodhi, N.S., Soh, M.C.K., Lim, H.C., 2003. Abundance and projected control of Invasive House Crows in Singapore. J. Wildl. Manage. 67, 808–817.
Bull, J., 1971. Monk Parakeets in the New York City Region. Linnaean News-Lett. 25, 1–2.
Burger, J., Gochfeld, M., 2009. Exotic monk parakeets (*Myiopsitta monachus*) in New Jersey: nest site selection, rebuilding following removal, and their urban wildlife appeal. Urban Ecosyst. 12, 185–196.
Cáceres, N.C., Moura, M.O., 2003. Fruit removal of a wild tomato, *Solanum granulosoleprosum* Dunal (Solanaceae), by birds, bats and non-flying mammals in an urban Brazilian environment. Rev. Bras. Zool. 20, 519–522.
Cardozo, G., Beltzer, A., Collins, P., 2008. Variación primavero–estival de la diversidad y abundancia de la comunidad de aves en la reserva ecológica de la Ciudad Universitaria U.N.L. "El Pozo" (Spring–summer variation of bird diversity and abundance in the ecological reserve of the Ciudad Universitaria U.N.L. "El Pozo"). Miscelanea 17, 367–386 (in Spanish).
Caula, S., De Nóbrega, J.R., Giner, S., 2003. La diversidad de aves como elemento de una estrategia de conservación del Jardín Botánico de Valencia, Venezuela (The bird diversity as element of conservation strategy of the Botanical Garden of Valencia City, Venezuela). Acta Biol. Venez. 23, 1–13 (in Spanish).
Chace, J.F., Walsh, J.J., 2006. Urban effects on native avifauna: a review. Landscape Urban Plan. 74, 46–69.
Clergeau, P., Jökimaki, J., Savard, J., 2001. Are urban bird communities influenced by the bird diversity of adjacent landscapes? J. Appl. Ecol. 38, 1122–1134.
Clergeau, P., Savard, J.L., Mennechez, G., Falardeau, G., 1998. Bird abundance and diversity along an urban-rural gradient: a comparative study between two cities on different continents. Condor 100, 413–425.
Clergeau, P., Croci, S., Jokimäki, J., Kaisanlahti-Jokimäki, M.L., Dinetti, M., 2006. Avifauna homogenisation by urbanisation: analysis at different European latitudes. Biol. Conserv. 127, 336–344.
Croci, S., Butet, A., Clergeau, P., 2008. Does urbanization filter birds on the basis of their biological traits? Condor 110, 223–240.
Crooks, K.R., Suarez, A.V., Bolger, D.T., 2004. Avian assemblages along a gradient of urbanization in a highly fragmented landscape. Biol. Conserv. 115, 451–462.
Cupul-Magaña, F.G., 2003. Nota sobre colisiones de aves en las ventanas de edificios universitarios en Puerto Vallarta, México (Notes on bird collisions with windows of university buildings in Puerto Vallarta). Huitzil 4, 17–21 (in Spanish).
Daniels, G.D., Kirkpatrick, J.B., 2006. Does variation in garden characteristics influence the conservation of birds in suburbia? Biol. Conserv. 133, 326–335.
de Lima, F.C.T., Aleixo, A., 2000. Notas sobre algumas aves em ambientes antropizados da cidade de campinas, Sao Paulo, Brasil (Observations on bird species found in urban habitats in the city of Campinas, Sao Paulo, Brazil). Boletín CEO 14, 2–6 (in Portuguese).
de Vasconcelos, M.F., 1998. Urban environment utilization by the squirrel cuckoo, *Piaya cayana*: the importance of urban trees. Ciencia Cult. 50, 462–464.
Devictor, V., Julliard, R., Clavel, J., Jiguet, F., Lee, A., Couvet, D., 2007. Functional biotic homogenization of bird communities in disturbed landscapes. Global Ecol. Biogeogr. 17, 252–261.
Echeverría, A.I., Vassallo, A.I., Isacch, J.P., 2006. Experimental analysis of novelty responses in a bird assemblage inhabiting a suburban marsh. Can. J. Zool. 84, 974–980.
Echeverría, A.I., Vassallo, A.I., 2008. Novelty responses in a bird assemblage inhabiting an urban area. Ethology 114, 616–624.
Eduardo, C., Carvalho, A., Marini, M.A., 2007. Distribution patterns of diurnal raptors in open and forested habitats in south-eastern Brazil and the effects of urbanization. Bird Conserv. Int. 17, 367–380.
Emlen, J.T., 1974. An urban bird community in Tucson, Arizona: derivation, structure, regulation. Condor 76, 184–197.
Escofet, A., Espejel, I., 1999. Conservation and management-oriented ecological research in the coastal zone of Baja California, Mexico. J. Coast. Conserv. 5, 43–50.
Evans, K.L., Newson, S.E., Gaston, K.J., 2009. Habitat influences on urban avian assemblages. Ibis 151, 19–39.
Faggi, A.M., Krellenberg, K., Castro, R., Arriaga, M., Endlicher, W., 2006. Biodiversity in the Argentinean Rolling Pampa ecoregion: changes caused by agriculture and urbanization. Erdkunde 60, 127–138.
Faggi, A.M., Perepelizin, P.V., 2006. Bird richness along an urbanization gradient in Buenos Aires city. Rev. Mus. Arg. Ciencias Naturales (n.s.) 8, 289–297.
Faggi, A.M., Ignatieva, M., 2009. Urban green spaces in Buenos Aires and Christchurch. In: Proceedings of ICE: Municipal Engineer, vol. 162 , pp. 241–250.
Faggi, A.M., Perepelizin, P.V., Dadon, J.R., 2010. South Atlantic tourists resorts: predictors for changes induced by afforestation. In: Müller, N., Werner, P., Kelcey, J.G. (Eds.), Urban Biodiversity and Design. Blackwell Publishing, UK, pp. 363–379.
Fernández-Juricic, E., Dolores-Jiménez, M., Lucas, E., 2001. Bird tolerance to human disturbance in urban parks of Madrid (Spain): management implications. In: Marzluff, J.M., Bowman, R., Donnely, R. (Eds.), Avian Ecology and Conservation in an Urbanizing World. Kluwer Academic, Boston, pp. 259–273.
Fisher, J., Peterson, R.T., 1977. World of Birds. Crescent Books, New York.
Fisher, B., Christopher, T., 2007. Poverty and biodiversity: measuring the overlap of human poverty and the biodiversity hotspots. Ecol. Econ. 62, 93–101.
Folke, C., Jansson, A., Larsson, J., Costanza, R., 1997. Ecosystem appropriation by cities. Ambio 26, 167–172.
Fonaroff, L.S., 1974. Urbanization, birds, and ecological change in Northwestern Trinidad. Biol. Conserv. 6, 258–262.
Fontana, C.S., 2005. A ornitofauna de Porto Alegre no seculo XX: status de ocorrencia e conservação (The ornitofauna of Porto Alegre in the twentieth century: the occurrence and conservation status). Comun. Mus. Ciên. Tecnol. PUCRS, Sér. Zool. 18, 161–206 (in Portuguese).
French, K., Major, R., Hely, K., 2005. Use of native and exotic garden plants by suburban nectarivorous birds. Biol. Conserv. 121, 545–559.
Fujita, M., Koike, F., 2009. Landscape effects on ecosystems: birds as active vectors of nutrient transport to fragmented urban forests versus forest-dominated landscapes. Ecosystems 12, 391–400.
Fuller, R.A., Warren, P.H., Armsworth, P.R., Barbosa, O., Gaston, K.J., 2008. Garden bird feeding predicts the structure of urban avian assemblages. Divers. Distrib. 14, 131–137.
Galina, A.B., Gimenes, M.R., 2006. Riqueza, composição e distribuição espacial da comunidade de aves em um fragmento florestal urbano em Maringá, Norte do Estado do Paraná, Brasil (Richness, composition and spatial distribution of bird community on an urban forest fragment at Maringá, Northern Paraná State, Brazil). Acta Sci. Biol. Sci. 28, 379–388 (in Portuguese).
Garaffa, P.I., Filloy, J., Bellocq, M.I., 2009. Bird community responses along urban–rural gradients: does the size of the urbanized area matter? Landscape Urban Plan. 90, 33–41.
Gómez, V.E., 2006. Aves del General San Martín Park (Mendoza). Distribución y características (Birds in the Parque General San Martín (Mendoza). Distribution and characteristics). Multequina 15, 81–95 (in Spanish).
González-Oreja, J.A., Bonache-Regidor, C., Buzo-Franco, D., de la Fuente-Díaz Ordaz, A.A., Hernández-Satín, L., 2007. Caracterización ecológica de la avifauna de los parques urbanos de la Ciudad de Puebla (México) (Ecological characterization of the avifauna of the urban parks of the City of Puebla (México)). Ardeola 54, 53–67 (in Spanish).
Gowaty, P.A., 1984. House Sparrows kill Eastern Bluebirds. J. Field Ornithol. 55, 378–380.
Grimm, N.B., Grove, J.M., Pickett, S.T.A., Redman, C.L., 2000. Integrated approaches to long-term studies of urban ecological systems. Bioscience 50, 571–584.
Guix, J.C., 2007. The role of alien plants in the composition of fruit-eating bird assemblages in Brazilian urban ecosystems. Orsis 22, 87–104.
Hollweg, K.S., Berkowitz, A.R., Nilon, C.H., 2003. Foundations and frontiers from education theory and practice: Themes. In: Berkowitz, A.R., Hollweg, K.S., Nilon, C.H. (Eds.), Understanding Urban Ecosystems. Springer-Verlag, New York, pp. 229–231.
Husté, A., Selmi, S., Boulinier, T., 2006. Bird communities in suburban patches near Paris: determinants of local richness in a highly fragmented landscape. Ecoscience 13, 249–257.
Juri, M.D., Chani, J.M., 2005. The composition of a bird community and its variation along an urban gradient (Tucuman, Argentina). Acta Zool. Lilloana 49, 49–57.
Kath, J., Maron, M., Dunn, P.K., 2009. Interspecific competition and small bird diversity in an urbanizing landscape. Landscape Urban Plan. 92, 72–79.
Lepczyk, C.A., Flather, C.H., Radeloff, V.C., Pidgeon, A.M., Hammer, R.B., Liu, J., 2008. Human impacts on regional avian diversity and abundance. Conserv. Biol. 22, 405–416.
Leveau, L.M., Leveau, C.M., 2004. Comunidades de aves en un gradiente urbano de la ciudad de Mar del Plata, Argentina (Bird communities along an urban gradient in Mar del Plata City, Argentina). Hornero 19, 1–12 (in Spanish).
Leveau, C.M., Leveau, L.M., 2005. Avian community response to urbanization in the Pampean Region, Argentina. Ornitol. Neotrop. 16, 503–510.
Leveau, C.M., Leveau, L.M., 2006. Ensambles de aves en calles arboladas de tres ciudades costeras del sudeste de la provincia de Buenos Aires, Argentina (Bird assemblages in wooded streets along three coastal cities in Southeastern Buenos Aires Province, Argentina). Hornero 21, 1–8 (in Spanish).
Leveau, L.M., 2008. Dynamics of nectarivory in the House Sparrow in an urban environment. Ornitol. Neotrop. 19, 275–281.
Levin, L., Fajardo, L., Ceballos, N., 2000. Orden de llegada y agresiones en aves urbanas en una fuente de alimento controlada (Arrival order and aggrsssions of urban birds in a controlled feeder). Ecotropicos 13, 75–80 (in Spanish).
Lim, H.C., Sodhi, N.S., 2004. Responses of avian guilds to urbanisation in a tropical city. Landscape Urban Plan. 66, 199–215.
Lim, H.C., Sodhi, N.S., 2009. Space use and habitat selection of House Crows in a tropical urban environment: a radio-tracking study. Raffles Bull. Zool. 57, 561–568.
Lockwood, J.L., Brooks, T.M., McKinney, M.L., 2000. Taxonomic homogenization of the global avifauna. Anim. Conserv. 3, 27–35.
Lopes, E.V., dos Anjos, L., 2006. A composição da avifauna do campus da Universidade Estadual de Londrina, norte do Paraná, Brasil (The avifaunal composition of Universidade Estadual de Londrina northern Paraná, Brazil). Rev. Bras. Zool. 23, 145–156 (in Portuguese).
López-Flores, V., MacGregor-Fors, I., Schondube, J.E., 2009. Artificial nest predation along a Neotropical urban gradient. Landscape Urban Plan. 92, 90–95.
Lucero, M.M., Brandan, Z.J., Chani, J.M., 2005. Composition and annual variation of the avifauna in three large parks of San Miguel de Tucuman (Tucuman, Argentina). Acta Zool. Lilloana 49, 43–48.
Maceda, J.J., Kin, M.S., 2001. Lista de las aves de la Facultad de Agronomía de Santa Rosa (La Pampa) y sus alrededores (Bird list of the Facultad de Agronomía de

Santa Rosa (La Pampa) and surroundings). Rev. Fac. Agron. Univ. Nac. La Pam. 12, 21–30 (in Spanish).
MacGregor-Fors, I., 2004. Primer registro Chara de San Blas (*Cyanocorax sanblasianus*) para Guadalajara, Jalisco, México (First register of *Cyanocorax sanblasianus* for Guadalajara, Jalisco, México). Huitzil 5, 5–6 (in Spanish).
MacGregor-Fors, I., 2005. Listado ornitológico del Centro Universitario de Ciencias Biológicas y Agropecuarias, Universidad de Guadalajara, Jalisco, México: un espacio suburbano (Check-list of birds of the Centro Universitario de Ciencias Biológicas y Agropecuarias, Universidad de Guadalajara, Jalisco, México: a suburban area). Huitzil 6, 1–6 (in Spanish).
MacGregor-Fors, I., 2008. Relation between habitat attributes and bird richness in a western Mexico suburb. Landscape Urban Plan. 84, 92–98.
MacGregor-Fors, I., Schondube, J.E., Morales-Pérez, L., Quesada, J., 2008. Ampliación del ámbito geográfico-altitudinal y uso de hábitats suburbanos por la mascarita pico grueso (*Geothlypis poliocephala*) (Geographic-altitudinal range extension and suburban habitat use of the Grey-crowned Yellowthroat (*Geothlypis poliocephala*)). Rev. Mex. Biodivers. 79, 533–534 (in Spanish).
MacGregor-Fors, I., Ortega-Álvarez, R., Schondube, J.E., 2009a. On the ecological quality of urban systems: an ornithological perspective. In: Graber, D.S., Birmingham, K.A. (Eds.), Urban Planning in the 21st Century. Nova Science Publishers, New York, pp. 51–66.
MacGregor-Fors, I., Vázquez, L., Vega-Rivera, J.H., Schondube, J.E., 2009b. Non-exotic invasion of Great-tailed Grackles *Quiscalus mexicanus* in a tropical dry forest reserve. Ardea 97, 367–369.
MacGregor-Fors, I., Morales-Pérez, L., Quesada, J., Schondube, J.E., 2010. Relationship between the presence of House Sparrows (*Passer domesticus*) and Neotropical bird community structure and diversity. Biol. Invasions 12, 87–96.
Major, R.E., Gowing, G., Kendal, C.E., 1996. Nest predation in Australian urban environments and the role of the pied currawong, *Strepera graculina*. Aust. J. Ecol. 21, 399–409.
Manhães, M.A., Loures-Ribeiro, A., 2005. Spatial distribution and diversity of bird community in an urban area of Southeast Brazil. Braz. Arch. Biol. Technol. 48, 285–294.
Maragliano, R.E., Lucas, J.M., Ibañez, L.M., Montalti, D., 2009. Comunidades de aves urbanas de Lavallol, Buenos Aires, Argentina (Urban bird community in Lavallol, Buenos Aires, Argentina). Acta Zool. Lilloana 53, 108–114 (in Spanish).
Marcondes-Machado, L.O., Piratelli, A.J., Madi, R.R., 1994. Experiência de manejo de aves em áreas antrópicas, com a utilização de caixas de madeira como locais para nidificação (Experimental birds management in anthropic areas, using nest-boxes). Rev. Bras. Zool. 11, 749–758 (in Portuguese).
Marín-Gómez, O.H., 2005. Avifauna del campus de la Universidad del Quindío (Avifauna of the Universidad del Quindío campus). Boletín SAO 15, 42–60 (in Spanish).
Marzluff, J.M., Bowman, R., Donnely, R., 2001. A historical perspective on urban bird research: trends, terms, and approaches. In: Marzluff, J.M., Bowman, R., Donnely, R. (Eds.), Avian Conservation and Ecology in an Urbanizing World. Kluwer Academic, Boston, pp. 1–17.
Marzluff, J.M., Ewing, K., 2001. Restoration of fragmented landscapes for the conservation of birds: a general framework and specific recommendations for urbanizing landscapes. Restor. Ecol. 9, 280–292.
Mason, J., Moorman, C., Hess, G., Sinclair, K., 2007. Designing suburban greenways to provide habitat for forest-breeding birds. Landscape Urban Plan. 80, 153–164.
McDonnell, M.J., Picket, S.T.A., Pouyat, R.V., 1993. The application of the ecological gradient paradigm to the study of urban effects. In: McDonnell, M.J., Picket, S.T.A. (Eds.), Humans as Components of Ecosystems. Springer-Verlag, New York, pp. 175–189.
McKinney, M.L., 2002. Urbanization, biodiversity, and conservation. Bioscience 52, 883–890.
McKinney, M.L., 2006. Urbanization as a major cause of biotic homogenization. Biol. Conserv. 127, 247–260.
McKinney, M.L., 2008. Effects of urbanization on species richness: a review of plants and animals. Urban Ecosyst. 11, 161–176.
Melles, S., Glenn, S., Martin, K., 2003. Urban bird diversity and landscape complexity: species environment association along a multi-scale habitat gradient. Conserv. Ecol. 1, 5.
Mellink, E., Riojas-López, M., 2009. Waterbirds and human-related threats to their conservation in Laguna Cuyutlán, Colima, México. Int. J. Trop. Biol. Conserv. 57, 1–12.
Monnerat-Nogueira, D., de Andrade-Rangel de Freitas, A., Pinheiro da Silva, C., Moreno de Souza, L., 2005. Estudio de la avifauna y sus ectoparásitos en un fragmento de bosque Atlántico en la Ciudad del Río de Janeiro, Brasil (Birds and their ectoparasites in a forest fragment of Rio de Janeiro, Brazil). Boletín SAO 15, 26–36 (in Spanish).
Montaldo, N.H., López, H.E., 1992. Aves Silvestres de Pinamar y Villa Gesell (Wildbirds of Pinamar and Villa Gesell). Ed. Del Naturalista, Buenos Aires (in Spanish).
Montaldo, N.H., Claver, J.A., 1996. Guía de las aves silvestres de las Facultades de Agronomía y de Ciencias Veterinarias de la Universidad de Buenos Aires (Guide to the birds of the Agronomy and Veterinary Faculties of the Universidad de Buenos Aires). Rev. Fac. Agron. Univ. Buenos Aires 7, 191–216 (in Spanish).
Montgomery, M.R., 2008. The urban transformation of the developing world. Science 319, 761–764.
Munyenyembe, F., Harris, J., Hone, J., Nix, H., 1989. Determinants of bird populations in an urban area. Aust. J. Ecol. 14, 549–557.
Muñoz, M.C., Fierro-Calderón, K., Rivera-Gutierrez, H.F., 2007. Las aves del campus de la Universidad del Valle, una isla verde en Cali, Colombia (The birds of the Universidad del Valle campus, a green island in the city of Cali, Colombia). Ornitol. Colomb. 5, 5–20 (in Spanish).
Murgui, E., 2007. Effects of seasonality on the species-area relationship: a case study with birds in urban parks. Global Ecol. Biogeogr. 16, 319–329.
Naranjo, L.G., Estela, F., 1999. Inventario de la avifauna de un área suburbana de la Ciudad de Cali (Bird fauna inventory in a suburban area of Cali city). Boletín SAO 10, 11–27 (in Spanish).
Nilon, C.H., Berkowitz, A.R., Hollweg, K.S., 2003. Introduction: ecosystems understanding is a key to understanding cities. In: Berkowitz, A.R., Hollweg, K.S., Nilon, C.H. (Eds.), Understanding Urban Ecosystems. Springer-Verlag, New York, pp. 1–14.
Niemelä, J., 1999. Ecology and urban planning. Biodivers. Conserv. 8, 119–131.
Ortega-Álvarez, R., MacGregor-Fors, I., 2009. Living in the big city: effects of urban land-use on bird community structure, diversity, and composition. Landscape Urban Plan. 90, 189–195.
Ortega-Álvarez, R., MacGregor-Fors, I., 2010. What matters most? Relative effect of urban park habitat traits and hazards on urban park birds. Ornitol. Neotrop. 21, 519–533.
Parsons, H., Major, R.E., French, K., 2006. Species interactions and habitat associations of birds inhabiting urban areas of Sydney, Australia. Aust. Ecol. 31, 217–227.
Pauchard, A., Aguayo, M., Peña, E., Urrutia, R., 2006. Multiple effects of urbanization on the biodiversity of developing countries: the case of a fast-growing metropolitan area (Concepción, Chile). Biol. Conserv. 127, 272–281.
Perepelizin, P.V., Faggi, A.M., 2009. Diversidad de aves en tres barrios de la ciudad de Buenos Aires, Argentina (Bird diversity in three neighborhoods of Buenos Aires, Argentina). Multequina 18, 71–85 (in Spanish).
Petit, L.J., Petit, D.R., Christian, D.G., Powell, H.D.W., 1999. Bird communities of natural and modified habitats in Panama. Ecography 22, 292–304.
Petry, M.V., Scherer, J.M., 2008. Distribuição da avifauna em um gradiente no Rio Dos Sinos, São Leopoldo, Rio Grande do Sul, Brasil (Avifauna distribution in an urban gradient along Sinos River, São Leopoldo, Rio Grande do Sul, Brazil). Biodivers. Pampeana 6, 19–29 (in Portuguese).
Pinheiro, C.E.G., 2003. Does Müllerian mimicry work in nature? Experiments with butterflies and birds (Tyrannidae). Biotropica 35, 356–364.
Pitelka, F.A., 1942. High population of breeding birds within an artificial habitat. Condor 44, 172–174.
Ralph, C.J., Geupel, G.R., Pyle, P., Martin, T.E., DeSante, D.F., Milá, B., 1996. Manual de Métodos de Campo para el Monitoreo de Aves Terrestres (Handbook of Field Methods for Monitoring Landbirds). U. S. Department of Agriculture, Forest Service, Pacific Southwest Research Station, Albany (in Spanish).
Ramírez-Albores, J.E., 2008. Comunidad de aves de la Facultad de Estudios Superiores Zaragoza campus II, UNAM, Ciudad de México (Bird community of the Facultad de Estudios Superiores Zaragoza campus II, UNAM, Mexico City). Huitzil 9, 12–19 (in Spanish).
Reynaud, P.A., Thioulouse, J., 2000. Identification of birds as biological markers along a neotropical urban-rural gradient (Cayenne, French Guiana), using co-inertia analysis. J. Environ. Manage. 59, 121–140.
Rivera-Gutierrez, H.F., 2006. Composición y estructura de una comunidad de aves en un área suburbana en el suroccidente colombiano (Composition and structure of a suburban bird community in southwestern Colombia). Ornitol. Colomb. 4, 28–38 (in Spanish).
Robb, G.N., McDonald, R.A., Chamberlain, D.E., Bearhop, S., 2008. Food for thought: supplementary feeding as a driver of ecological change in avian populations. Front. Ecol. Environ. 6, 476–484.
Rodríguez-Estrella, R., 2007. Land use changes affect distributional patterns of desert birds in the Baja California Peninsula, Mexico. Divers. Distrib. 13, 877–889.
San Martín-Órdenes, J.A., 2009. Un ejemplo de explotador urbano: consumo de frutos de árboles exóticos por el jilguero (*Carduelis barbata*), en dos centros urbanos de la zona central de Chile (An example of an urban exploiter: exotic-tree fruit consumption by *Carduelis barbata* in two urban areas of central Chile). Nuestras Aves 54, 30–32 (in Spanish).
Sazima, I., Sazima, M., 2007. Petiscos florais: pétalas de *Acca sellowiana* (Myrtaceae) como fonte alimentar para aves em área urbana no Sul do Brasil (Floral titbits: petals of *Acca sellowiana* (Myrtaceae) as a food source for birds in an urban area in Southern Brazil). Biota Neotrop. 7, 307–311 (in Portuguese).
Scherer, A., Barboza-Scherer, S., Bugoni, L., Vianna Mohr, L., Amorim-Efe, M., Hartz, S.M., 2005. Estrutura trófica da Avifauna em oito parques da cidade de Porto Alegre, Rio Grande do Sul, Brasil. Ornithologia 1, 25–32 (in Portuguese).
Serrano do Nascimento, I.L., Schulz-Neto, A., Soares-Alves, V., Maia, M., Amorim-Efe, M., Rodrigues-Telino, W., Faria do Amaral, M., 2005. Diagnóstico da situação nacional de Colisões de aves com aeronaves (Diagnostic of national birds strikes collisions). Ornithologia 1, 93–104 (in Portuguese).
Shochat, E., 2004. Credit or debit? Resource input changes population dynamics of city-slicker birds. Oikos 106, 622–626.
Shochat, E., Warren, P.S., Faeth, S.H., McIntyre, N.E., Hope, D., 2006. From patterns to emerging processes in mechanistic urban ecology. Trends Ecol. Evol. 21, 186–191.
Silva, F.D.S., Blamires, D., 2007. Avifauna urbana no Lago Pôr do Sol, Iporá, Goiás, Brasil. Lundiana 8, 17–26.
Simon, U., Kübler, S., Böhner, J., 2007. Analysis of breeding bird communities along an urban-rural gradient in Berlin, Germany, by Hasse Diagram Technique. Urban Ecosyst. 10, 17–28.
Soares, A.G., 2004. A avifauna de uma área no bairro Ribeirão da Ilha, Florianópolis, Santa Catarina: Levantamento e implicações para a educação ambiental (The

avifauna of an area in the borough of Ribeirão da Ilha, Florianópolis, Santa Catarina: survey and implications for the environmental education). Biotemas 17, 107–124 (in Portuguese).
Sodhi, N.S., 2008. Tropical biodiversity loss and people—a brief review. Basic Appl. Ecol. 9, 93–99.
Soh, M.C.K., Sodhi, N.S., Seoh, R.K.H., Brook, B.W., 2002. Nest site selection of the house crow (*Corvus splendens*) an urban invasive bird species in Singapore and implications for its management. Landscape Urban Plan. 59, 217–226.
Sol, D., Santol, D.M., Feria, E., Clavell, J., 1997. Habitat selection by the monk parakeet during colonization of a new area in Spain. Condor 99, 39–46.
Sorace, A., Gustin, M., 2008. Homogenisation processes and local effects on avifaunal composition in Italian towns. Acta Oecol. 33, 15–26.
Spescha, L., Faggi, A.M., Scarpati, O., 2004. La golondrina doméstica como indicador fenológico del cambio global (The Barn Swallow as a phenological indicator of global change). Diversidad y Ambiente 1, Available on-line at [http://www.idejazz-uflo.org.ar/diversidadyambiente/index.htm] (in Spanish).
Stiles, S.G., 1990. La avifauna de la Universidad de Costa Rica y sus alrededores através de veinte años (1968–1989) (The avifauna of the Universidad de Costa Rica and surrounding areas in a twenty-year period (1968–1989)). Rev. Biol. Trop. 38, 361–381 (in Spanish).
Suarez-Rubio, M., Thomlinson, J.R., 2009. Landscape and patch-level factors influence bird communities in an urbanized tropical island. Biol. Conserv. 142, 1311–1321.
Takano-Goshima, F., Castro-Izaguirre, N., 2007. Avifauna del Campus de la Universidad Nacional Agraria La Molina (UNALM), Lima-Perú (Avifauna of the Universidad Nacional Agraria La Molina (UNALM) campus). Ecol. Appl. 6, 149–154 (in Spanish).
Tampson, V.E., Petry, M.V., 2008. Nidificação e análise das guildas alimentares de aves no Morro do Espelho, na zona urbana de São Leopoldo-RS (Nesting and feeding guilds analysis of the birds of Morro do Espelho, in the urban area of São Leopoldo). Biodivers. Pampeana 6, 63–69 (in Portuguese).
Tan, K.W.A., 2006. A greenway network for Singapore. Landscape Urban Plan. 76, 45–66.
Torga, K., Franchin, A.G., Marçal Júnior, O., 2007. A avifauna em uma seção da área urbana de Uberlândia, MG (Avifauna in a section of the urban area of Uberlândia, MG). Biotemas 20, 7–17 (in Portuguese).
Turner, W.R., 2003. Citywide biological monitoring as a tool for ecology and conservation in urban landscapes: the case of the Tucson Bird Count. Landscape Urban Plan. 65, 149–166.
United Nations, 2008. World Urbanization Prospects: The 2007 Revision, Data Tables and Highlights. Population Division of the Department of Economic and Social Affairs, New York.
Valadão, R.M., Marçal Júnior, O., Franchin, A.G., 2006. A avifauna no parque municipal Santa Luzia, zona urbana de Uberlândia, Minas Gerais (The avifauna in the Santa Luzia Municipal Park, urban zone of the municipality of Uberlândia, state of Minas Gerais). B. J. Uberlândia 22, 97–108 (in Portuguese).
Valdés-Peña, R., Gozalez-Rojas, J.I., 2006. Feral parrots in Monterrey, Mexico: another result of the illegal bird trade. PsittaScene 18, 8–9.
Vallejo, B.M., Aloy, A.B., Ong, P.S., 2009. The distribution, abundance and diversity of birds in Manila's last greenspaces. Landscape Urban Plan. 89, 75–85.
VanBael, S., Pruett-Jones, S., 1996. Exponential population growth of Monk Parakeets in the United States. Wilson Bull. 108, 584–588.
van Rensburg, B.J., Peacock, D.S., Robertson, M.P., 2009. Biotic homogenization and alien bird species along an urban gradient in South Africa. Landscape Urban Plan. 92, 233–241.
Vásquez-Muñoz, J.L., Castaño-Villa, G.J., 2008. Identificación de áreas prioritarias para la conservación de la avifauna en la zona urbana del Municipio de Medellín, Colombia (Identification of priority conservation areas of birds in the urban area of Medellín, Colombia). Bol. Cient. Mus. Hist. Nat. Univ. Caldas 12, 51–61 (in Spanish).
Villanueva-Villanueva, R.E., da Silva, M., 1995. Conservation status of the bird fauna of the Campeche region, Santa Catarina island, SC. Biotemas 8, 72–80.
Villegas, M., Garitano-Zavala, Á., 2010. Bird community responses to different urban conditions in La Paz, Bolivia. Urban Ecosyst. 13, 375–391.
Vinhola da Silva, R.R., 2003. Contribuição à avifauna observada na praia do Mar Grosso em Laguna, SC. Biotemas 16, 181–187 (in Portuguese).
Vinhola da Silva, R.R., 2006. Estrutura de uma comunidade de aves em Caxias do Sul, Rio Grande do Sul, Brasil (Structure of avian community in Caxias do Sul, Rio Grande do Sul). Biociencias 14, 27–36 (in Portuguese).
Vitali-Veiga, M.J., Machado, V.L.L., 2000. Visitantes florais de *Erythrina speciosa* Andr. (Leguminosae) (Floral visitors of Erythrina speciosa Andr. (Leguminosae)). Rev. Bras. Zool. 17, 369–383 (in Portuguese).
Young, K.M., Daniels, C.B., Johnston, G., 2007. Species of street tree is important for southern hemisphere bird trophic guilds. Aust. Ecol. 32, 541–550.
Zulma, B., Marigliano, N.L., Navarro, C.I., Antelo, C.M., 2006. Estructura y composición específica de la comunidad de aves en un área suburbana de la Provincia de Tucumán, Argentina (Structure and specific composition of an avian community at a suburban site in the Tucumán Province, Argentina). Acta Zool. Lilloana 50, 47–53 (in Spanish).