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Birds and small urban parks: a study in a high plateau city

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Abstract: The goal of the present study was to assess which variables influence the distribution of birds in urban parks. Twenty parks were studied in a city on the Spanish high plateau during the breeding season, and relationships among park characteristics, bird richness, and individual bird presences were established. The park area and tree cover accounted for 73.1% of the variation in bird richness. Although area size was the best predictor of species richness (65% of the variation), some species did not seem to be related to this variable but rather to others, such as vegetation and the degree of park isolation with respect to other areas. Contrary to what is normally expected, the distance from our parks to the river did not influence their bird species richness.

Key words: Urban parks, birds, river, Spain, park size, vegetation

1. Introduction

Currently, the human population continues to increase and dominate many ecosystems around the world (Horiuchi, 1992; Vitousek et al., 1997). Approximately 80% of the human population in developed countries is concentrated in cities (World Resources Institute, 2006), and urban areas are expanding both in size and number (Melles et al., 2003). This worldwide urbanisation is one of the most important factors affecting global diversity (Jokimäki and Kaisanlahthi-Jokimäki, 2003), because the development of urban areas causes the fragmentation of large natural areas into smaller patches. Thus, the fragmentation caused by human activity has been considered one of the most important causes of the loss of biodiversity (Wilcox and Murphy, 1985), since the number of species and their abundance depend on parameters such as habitat size, the degree of their isolation, and habitat heterogeneity (Blondel, 1991).

Birds are a relatively conspicuous and easily detectable group. Accordingly, several studies have been conducted using them as indicators of habitat characteristics (Sändstrom, 2006). Moreover, birds show a marked sensitivity to environmental alteration (Furness et al., 1993). Thus, they are currently favoured in research on urban environments (Palomino and Carrascal, 2005), and about one-third of all research on wildlife and urban environment is supported by bird data (Magle et al., 2012).

Humans exert an effect on the ecosystem where they settle, affecting its processes and dynamics and consequently the composition of the avian community and its structure (Bowman and Marzluff, 2001). In general, urbanisation decreases bird species diversity and richness, but increases their densities (Lancaster & Rees 1979). Owing to the rapid expansion of urban environments, it is crucial to know which factors may limit the presence of birds in urban habitats (Jokimäki and Suhonen, 1998), and research allowing adequate planning management aimed at increasing or preserving biodiversity in urban areas is needed (White, 1994).

Different approaches have been used to study birds in urban environments. A common approach is to analyse avian communities with respect to a spatial gradient of urbanisation (Williamson and DeGraaf, 1980; Blair, 2004; Crooks et al., 2004; Marzluff, 2005; Simon et al., 2007), but also taking into account progressive urbanisation along time (Aldrich and Coffin, 1980). Another often used approach is the application of the habitat-island pattern to study the patches generated in the urban environment, especially parks (Jokimäki, 1999; Natuara and Imai, 1999; Fernández-Juricic, 2000b; Fernández-Juricic and Jokimäki, 2001), and even the study of avian communities inside large parks (Cicero, 1989; Shwartz et al., 2008), or the role of wooded streets as corridors inside the urban matrix (Fernández-Juricic, 2000a, 2001c; White et al., 2005). The differences between bird communities in urban environments versus natural ones have been compared (Palomino and Carrascal, 2006), as well as the differences

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between urban communities located at different latitudes (Jokimäki et al., 2002; Clergeau et al., 2006). Yet another way is to study how introduced species use urban habitats (Murgui and Valentín, 2003).

It is important to note the role of urban parks, because they harbour higher bird richness and diversity than other urban habitats (Tilghman, 1987) and should be considered as plots separated from one another by an urban matrix of different habitats (Gilbert, 1989). Despite their original recreational function, parks may compensate for the lack of natural environments in urban areas and hence contribute to biodiversity conservation (Cornelis and Henry, 2004). Taking into account the fast growth of human populations, parks are taking on a crucial role in the protection of birds against urban alterations (Cicero, 1989).

Here we analysed some relationships among the avian species and the size, degree of isolation, and habitat characteristics of the parks of a supra-Mediterranean European city based on the western Spanish plateau, including the possible influence of the nearby river.

2. Materials and methods

2.1. Study area

The study area comprised 20 parks in Salamanca (5°41′W, 40°48′N), a small/medium-sized city with a population of about 180,000 inhabitants, spread over almost 38.6 km^2 and with a relatively high degree of urbanisation. Most of the urban area of the city is situated on the right bank of the River Tormes, which has riparian vegetation in a relatively good state of conservation. Considering its geographic situation, the characteristics of the surrounding terrain, and its altitude (808 m a.s.l.), the climate of Salamanca is continental and mostly dry. The warmest month is July, with a mean temperature of 21.9 °C, and the coldest one January, with 3.4 °C; the precipitation mean is around 400 mm/year.

In comparison with other European cities, Salamanca does not have large, well established parks with high tree cover, but although its continental climate is not very favourable, it does have several green garden areas and small parks for public use. Here all the 20 parks and public squares of the city (Table 1) were selected, with a total surface area of nearly 29 ha, and a range from 0.11 to 8.6 ha.

2.2. Bird sampling

The sampling consisted of a full survey of each park by line transects covering its total surface during the breeding seasons of 2009–2010 (April to May included). Census times ranged from 5 to 120 min, depending on the size of each park. We recorded the occurrence and number of

Table 1. Surface area (ha) of the Salamanca parks selected in the present study, ordered by number of species.

Parks	Surface Area (ha.)	Number of species
1 Jesuitas	8.6	14
2 Don Juan Tenorio	5.95	12
3 Ciudad Rodrigo	1.8	11
4 Fluvial	1.4	11
5 Campo San Francisco	1.02	9
6 Valhondo	1.61	7
7 Villar y Macías	1.88	7
8 Alamedilla	1.75	7
9 Pablo Picasso	1.04	6
10 Plaza del Concilio Trento	0.36	6
11 Plaza de Castilla y León	0.34	5
12 Plaza de Colón	0.38	4
13 San Juan Boscoso	0.4	4
14 Plaza de Anaya	0.42	4
15 Isidoro García Bravo	0.4	4
16 Juan Paz Maroto	0.3	3
17 Padre Jesús del Perdón	0.64	3
18 Plaza de los Bandos	0.2	3
19 Plaza de la Palma	0.4	3
20 Plaza Libertad	0.11	3

all bird species that used the parks for different purposes (feeding, mating and social interaction, nesting, etc.), except over-flying individuals. Samplings were carried out between 0700 and 0900 on days without rain or strong winds, and a total of 7 visits to each park were done.

2.3 Variables measured

The variables related to park size, degree of isolation, and habitat characteristics are depicted in Table 2.

Each park and its isolation variables were measured with SipPac 3.0 (http://sigpac.mapa.es/fega/visor/), used for the Agricultural Plot Identification System. The minimum distance of each park larger than 1 ha to the River Tormes and to the city border (where the matrix of buildings changes to an open landscape, normally involving cereal cultivation) were measured as the isolation variables.

The park variables were taken at 20 × 20 m sampling points distributed along transects that divided the parks longitudinally; each point was separated by 20 m from the others and 10 m from the park border. In larger parks, other parallel transects were made at a distance of 40 m from the longitudinal one. The numbers of tree and shrub species were counted at each sampling point, and the trees were divided into 4 different diameter categories (10 cm, 10–30 cm, 30–50 cm, and larger than 50 cm). Moreover, tree, shrub, and lawn cover and the proportions of bare and paved soil were estimated visually.

2.4. Data analysis

Analyses were conducted using species richness and the occurrence of individual bird species as dependent variables. The differences in bird richness among parks were analysed by a forward stepwise multiple regression analysis (Trexler and Travis, 1993). The relationships between species richness and the independent variables that characterised each park were analysed with the Spearman rank correlation test (Siegel and Castellán, 1988).

Table 2. Variables used in the characterisation of the parks.

Variables
Area (ha) (AREA)
Minimum distance to the city border (ISO1)
Minimum distance to the river (ISO2)
Minimum distance to the park > 1 ha (ISO3)
Mean number of tree species (NTREESP)
Mean number of shrub species (NSHRUBSP)
Mean % of tree cover (% TREE)
Mean % of shrub cover (% SHRUB)
Mean % of lawn cover (% LAWN)
Mean % of bare ground (% BARESOIL)
Mean % of paved ground (% PAVEDSOIL)
Mean number of trees < 10 cm d.b.h. (NTREE1)
Mean number of trees 10–30 cm d.b.h. (NTREE2)
Mean number of trees 30–50 cm d.b.h. (NTREE3)
Mean number of trees > 50 cm d.b.h. (NTREE4)
Mean number of trees (NTREE)

The presence or absence of bird species was modelled using logistic regression analysis, and the dependent variable—the presence or absence of each species in each park—was scored as 1 or 0, respectively. The significance of each variable included in the models was based on the Wald test (Hosmer and Lemeshow, 1989).

Using the independent variables selected by the former logistic regression model, which allowed a better biological interpretation, a canonical correspondence analysis (CCA) was performed. This technique orders species with the independent variables in such a way that the relationship between them can be seen easily (ter Braak, 1995). The significance of the ordinations was determined with a Monte Carlo test.

Regression analysis and correlations were performed with SPSS 13.0, whereas the CCA and Monte Carlo test were performed with CANOCO 4.5.

3. Results

A total of 21 species were observed during both years (Table 3). The mean number of species per park was 6.25 (SD = 3.477; n = 20) in 2009 and 6.32 (SD =3.523; n= 20) in 2010. As no statistically significant differences between the 2 years were observed (F = 0.802, n.s.), bird data were pulled together in the following results.

The regression model selected the park size as the first explanatory variable, explaining 65% of the variation. The model also included the tree cover, explaining 8.1% of the variation. These together explained 73.1% of the total variation (richness = 3.067 + 1.344 × area + 0.055 × tree cover; r-square = 0.731, F = 23. 092, P < 0.001). The model did not include isolation variables, such as the distance of each park to the river.

The correlations between the independent variables and bird richness were positively correlated with park size (Spearman r = 0.834, P < 0.001), and larger parks maintain higher vegetation structures as well as more bird species.

Owing to the small species sample size observed, only 15 bird species occurring in more than 10% of the parks were analysed. Only in 8 of those species was their presence at the parks explained by logistic regression models with 7 independent variables (Table 4).

The CCA ordination was statistically significant (Monte Carlo test, P = 0.008), the first canonical axis explaining 40% of the variation (eigenvalue = 0.164). With the second canonical axis (eigenvalue = 0.127), it explained 71% of

Table 3. Bird species recorded at the 20 urban parks in Salamanca.

PARKS	*Passer domesticus*	*Serinus serinus*	*Columba palumbus*	*Pica pica*	*Carduelis chloris*	*Turdus merula*	*Phoenicurus ochruros*	*Carduelis carduelis*	*Streptotelia decaocto*	*Galerida cristata*	*Sturnus unicolor*	*Oenanthe oenanthe*	*Columba livia*	*Passer montanus*	*Carduelis cannabina*	*Troglodytes troglodytes*	*Lanius senator*	*Hippolais polyglotta*	*Luscinia megarhynchos*	*Phylloscopus ibericus*	*Parus major*
1	x	x	x	x	x	x		x	x		x			x		x		x	x		x
2	x	x		x	x		x		x	x	x	x	x	x	x						
3	x	x		x	x		x	x		x	x	x			x		x				
4	x	x	x	x	x	x	x	x						x		x				x	
5	x	x	x	x	x	x	x	x	x												
6	x		x	x			x	x		x	x										
7	x		x			x		x	x		x				x						
8	x	x	x	x	x	x							x								
9	x	x	x	x	x								x								
10	x	x	x		x		x	x													
11	x	x	x			x			x												
12	x		x	x		x															
13	x	x	x		x																
14	x	x	x	x																	
15	x	x				x				x											
16	x						x					x									
17	x			x						x											
18	x					x			x												
19	x	x					x														
20	x								x												

the cumulative variance (Figure). The first axis represents the gradient related to the distance to the city borders, whereas the second one represents a gradient with respect to the shrub cover. The distance to the city surroundings negatively influenced the presence of the Crested Lark (*Galerida cristata*) and Northern Wheatear (*Oenanthe oenanthe*). Park size positively influenced the Tree Sparrow (*Passer montanus*) and the Spotless Starling (*Sturnus unicolor*) as well as the Linnet (*Carduelis cannabina*). The Eurasian Collared Dove (*Streptopelia decaocto*) correlated positively with the abundance of large and dense shrubs, in contrast to the Rock Dove (*Columba livia*) and Black Redstart (*Phoenicurus ochruros*), which tend to avoid such parks. The Greenfinch (*Carduelis chloris*) and European Serin (*Serinus serinus*) observations were positively correlated at parks with trees and shrubs. Finally, several species such as the House Sparrow (*Passer domesticus*), Magpie (*Pica pica*), Goldfinch (*Carduelis carduelis*), and Common Woodpigeon (*Columba palumbus*) did not show a clear relationship with any of the independent variables, although the last of these species (woodpigeon) showed a greater preference for dense shrubs (*Juniperus* spp.) taller than 4 m than for tree species.

4. Discussion

4.1. Species richness

Park size was found to be the main independent variable that most influenced bird richness in the urban parks of Salamanca. This result is similar to what has been reported for other parks worldwide (Jokimäki, 1999; Natuhara and Imai, 1999; Fernández-Juricic, 2000b; Park and Lee, 2000; Cornelis and Hermis, 2004; Platt and Lill, 2006; Murgui, 2007), supporting the notion that urban parks may be interpreted as "island habitats" and, therefore, that their richness is determined by a balance between species immigration and extinction, 2 parameters that depend on

Table 4. Logistic regression models for the bird species observed in more than 10% of the parks.

Species	Logistic model	Chi-square	P-value
Columba livia	No model		
Columba palumbus	% TREE (-)	9.329	0.002
Streptotelia decaocto	NSHRUBSP	5.378	0.02
Galerita cristata	ISO1 (-), NTREESP (-)	16.228	0.000
Phoenicurus ochruros	No model		
Oenanthe oentanthe	ISO 1 (-)	13.011	0.000
Turdus merula	NTREE, NTREESP (-)	10.605	0.005
Pica pica	No model		
Sturnus unicolor	AREA	17.336	0.000
Passer domesticus	No model		
Passer montanus	AREA	10.148	0.001
Carduelis cannabina	No model		
Carduelis carduelis	No model		
Carduelis chloris	% TREE, AREA	17.841	0.000
Serinus serinus	% SHRUB	4.537	0.033

the distance to the species sources and to the isolated area, respectively (McArthur and Wilson, 1967). In general, large areas tend to have greater heterogeneity and hence larger potential niche diversity (Martin et al., 1995). Thus, large parks must provide a larger number of habitats and harbour several species with different habitat requirements (Fernández-Juricic and Jokimäki, 2001). Moreover, any relationship between the abundance and number of species may be influenced by resource availability, such as food and breeding sites, which are favoured on larger surfaces (Suhonen and Jokimäki, 1988).

As observed elsewhere from SE Asia (Zhou et al., 2012) to South America (Leveau, 2013), resident bird species dominate urban parks: in our case up to 76%. However, although granivore species tend to be most abundant in more urbanised areas, only 43% of this trophic group, as compared with 38% of insectivorous species, was detected in Salamanca. In any case, and regardless of this theoretical feeding guild, efforts should be made to determine whether during the breeding season urban birds depend more on artificial feeding by park visitors or whether they seek natural food.

Furthermore, area size determines bird richness, owing to the biological requirements of each species (Hinsley et al., 1995). Thus, the fact that there were fewer species observed in the smallest parks can be explained in terms of their higher edge/area ratio. Accordingly, there are fewer specialist "interior" species (Platt and Lill, 2006). Moreover, taking into account the spatial and home-range differences between species (Schoener, 1968), the smallest parks may not be large enough to cover the minimum area requirements of certain large or medium-sized bird species (Jokimäki, 1999).

The regression model also included tree cover as a predictive variable in bird richness in urban parks (Gavareski, 1976; Tilghman, 1987). Normally, and especially in our area, urban parks have fewer areas with vegetation cover as compared to natural sites (Erz, 1966),

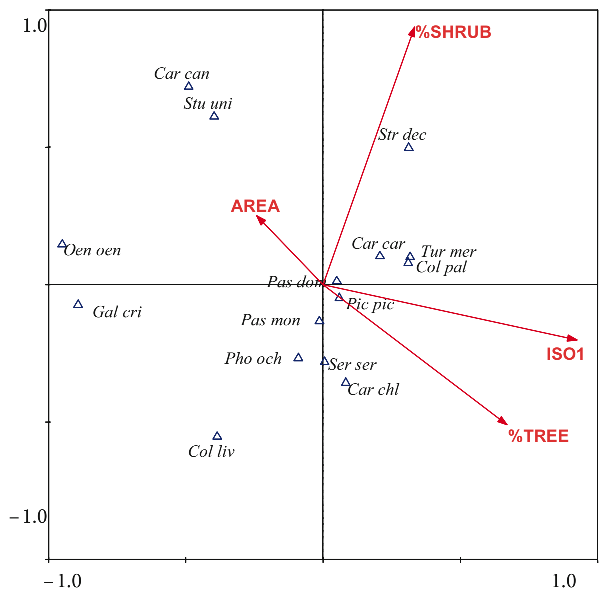

Figure. CCA ordination of bird species. The eigenvalue of the first axis is 0.164 and of the second axis is 0.127. Species abbreviations are the first 3 letters of their genus followed by the first 3 letters of the species epithet.

and because many avian species show a strong dependence on the vegetation cover for feeding and breeding a reduction in the tree cover at these habitats decreases both the abundance and diversity of birds (Lancaster and Rees, 1979). In light of the small areas of the parks in Salamanca and the plain and noncomplex vegetation structure, with only a few old trees and bushes present in most of them, the city maintains few bird species in comparison with other European cities such as Brussels (with 84 species) or Barcelona (with 76 species) (Herrando et al., 2012). Moreover, although intrusion by humans and dogs—with their accompanying noise—was high at all the parks, no measurable negative effect on species occurrence seemed to occur, as is the case in the many nondeveloped open spaces in Berlin (Meffert and Dziock, 2012). In fact, the total bird densities of SE Asian parks increase as a function of visitor rates during the bird breeding season, a parameter not measured by us but probably linked to artificial feeding by visitors. Additionally, human-made noise does not usually have a significant impact on species richness, diversity, or total density (Zhou and Chu, 2012).

In contraposition to the "island habitat" approach, no relationship between park isolation and bird richness was found, an observation also supported by the findings reported by other authors (Tilghman, 1987; Jokimäki, 1999; Natuhara and Imai, 1999; Fernández-Juricic, 2000b). The short distances (<700 m on average) among the study parks are probably not high enough for any bird species and they can fly from one park to another. Wooded streets function as corridors, reducing the level of isolation of the urban matrix (Fernández-Juricic, 2000; White et al., 2005), and although the city studied has no very leafy streets, it is possible that small green spaces (e.g., private gardens) could function as stepping stones, several small patches connecting otherwise isolated ones (Gilpin, 1980).

As a novelty with respect to some other studied cities, Salamanca has the peculiarity of being crossed by a relatively large river, mostly bordered by natural riparian vegetation. Such areas are the most diverse, dynamic, and complex biophysical habitats on the terrestrial portion of the Earth (Naiman et al., 1993). Riparian vegetation could act as a corridor for birds (Gillies et al., 2008), increasing population persistence by allowing a continuing exchange of individuals among previously connected populations (Rosenberg et al., 1997). Regardless of their role as corridors, riparian habitats support a wealth of biological diversity and are ecologically important per se. It is normally accepted that linear habitat patches such as these, lying between larger patches, are active corridors (Rosenberg et al., 1997). In fact, riparian vegetation provides habitats for more species of breeding birds than the surrounding uplands; e.g., 82% of all bird species breeding in northern Colorado occur in the context of riparian vegetation (Knopf, 1985).

Contrary to what was expected, the distance from our parks to the river did not influence their bird species richness. In order to explain why no relationship between the degree of isolation and bird distribution was detected, it should be taken into account that the role of corridors is still controversial. Few studies have demonstrated that corridors actually increase the rate of successful movement of animals between patches. In fact, one review has shown that in more than 30 studies assessing the usefulness of corridors for terrestrial vertebrates (Beier and Noss, 1998), only one-third provided evidence that corridors enhance landscape connectivity. It is also possible that riparian corridors might not always be used by birds (Skagen et al., 1998; Hannon and Schmiegelow, 2002). Furthermore, within an urban landscape the matrix "edge effect" has a significant impact on the quality of corridors. Consequently, the surrounding matrix has an impact on narrow corridors (Baschak and Brown, 1995), making their use difficult as effective pathways to urban parks. Finally, some riparian species such as warblers are mainly insect feeders, and they are unable to find their requisite food items in relatively clean urban parks, at least during the breeding season.

Accordingly, further investigation is needed to check whether the riparian vegetation of a city river sustains similar levels of biological diversity to what is expected in natural areas, and whether the river exports species to its surrounding man-made parks.

4.2. Species

Although area size was the best predictor of the bird species richness in the parks, the presence of most of the species, with the exception of the Spotless Starling, Greenfinch, Tree Sparrow, and Linnet, does not appear to be influenced by size but by other variables related to park characteristics and their degree of isolation.

Of all recorded species, the House Sparrow stands out, with an occurrence of 100% in the parks studied. This pattern occurs in other urban areas where bird communities are dominated by few species at high densities (Tilghman, 1987). The house sparrow is an urban exploiter in regard to its response to urbanisation (Blair, 1996), which favours its presence and abundance (Emlen, 1974; Beissinger and Osborne, 1982; Tweit and Tweit, 1986; Mills et al., 1989; Edgar and Kershaw, 1994; Sodhi, 1992).

The Rock Dove is also an urban exploiter, and it is spread across urban ecosystems around the world. Nevertheless, in our study it had a lower incidence. This could be related to the method used for the survey, foraging by the species in croplands on the outskirts of the city, or to the pest-control measures taken by the city authorities against the species, killing the birds with the help of cage traps deployed on several city buildings. In any case, the CCA revealed that Rock Doves were negatively related to the shrub cover, this being coherent with the results of other studies showing that the species avoids areas with a dense vegetation cover (Lancaster and Rees, 1979).

A comparison between European cities at different latitudes (Clergeau et al., 2006) showed that Goldfinches and tits (*Paridae*) were the commonest species in the central areas of cities (together with the Rock Dove, sparrows, and the Common Swift *Apus apus*). However, in our study, the Goldfinch was recorded in only 7 of the 20 parks studied and we were unable to generate any model explaining its distribution. Moreover, only one tit species, the Great Tit (*Parus major*), was recorded in just one park. This lack of tits may be due to the fact that most parks in Salamanca do not have a well-developed tree cover. Furthermore, Palomino and Carrascal (2006) classified the tit species in central Spain (northern part of the province of Madrid, at only 200 km from our study site) as urban-avoider species. Regarding our survey method, no record of swifts was taken.

Together with the Woodpigeon, the European Serin was the second species with the greatest presence, an observation also reported for other European cities (Clergeau et al., 2006 and references therein). Furthermore, this species has been classified as an urban exploiter in central Spain (Palomino and Carrascal, 2006). In our case, the presence of serins was positively related to the shrub cover, and the amount of shrubs appears to be the main habitat variable that increases bird tolerance to people in urban parks (Fernández-Juricic, 2001b).

The Common Woodpigeon had a significant incidence in our study, being recorded in 60% of the parks studied, and Fernández-Juricic (2000b) found the same incidence for this species in Madrid. Regarding our model, it seems that woodpigeons avoid parks with a dense tree cover. This seems somewhat incongruous considering the ecology of the species and the results of previous studies. For instance, Fernández-Juricic (2001b) reported that woodpigeons use trees as escape cover in urban parks. Probably, the relative short age and heavy pre-spring pruning of many trees in the city of Salamanca, as well as the relative isolation between them, could explain this.

Also of interest is the presence of the Crested Lark and the Northern Wheatear, both species correlated (in the logistic regression models and the CCA) with the distance to the city border. Both species breed in grasslands or open cultivated areas, and as feeding areas they only use outlying parks close to those sites. Furthermore, this distribution of the Crested Lark supports French results showing that these ground-breeding species are less abundant in city centres than around periurban sectors (Clergeau et al., 2006). As expected of an open-space species that avoids dense vegetation cover, the distribution of the crested lark was also negatively correlated with the number of tree species.

The Eurasian Collared Dove also chooses shrubby vegetation (the logistic model includes the number of shrub species and the CCA shows a correlation with the shrub cover), although larger species, such as woodpigeons and magpies, may also use shrubs (Fernández-Juricic, 2001b).

Blackbirds showed a negative relationship with the number of tree species, but a positive relationship with the number of trees. This suggests that blackbirds make an active microhabitat selection of urban park vegetation, and further research is needed to better elucidate this issue. For instance, coniferous cover increases blackbirds' tolerance to people (Fernández-Juricic et al., 2001).

Four species were positively related to the park area: the Spotless Starling (in both the logistic model and CCA), the Greenfinch (its model also included tree cover), the Tree Sparrow (in the logistic model), and the Linnet (in the CCA). This observation is similar to what has been reported in previous studies, and Jokimäki (1999) found that in Oulu (Finland) linnets did not occur in parks <1.5 ha, while for greenfinches the area was a variable that significantly affected its distribution, the influence of the urban matrix being more pronounced in small parks (Fernández-Juricic, 2000c). All these species act as "interior specialists" and their presence is influenced by the "edge effect" (Saunders et al., 1991). Thus, all species foraging in trees and on the ground, nesting in trees or tree cavities, except House Sparrows and Rock Doves, had lower numbers and breeding densities at the edges of interior areas of Madrid (Fernández-Juricic, 2001a). Another reason explaining why those species are positively related to park areas is the minimum area requirements of bird species and small parks are probably not large enough to meet these.

For the rest of the species there is no clear model to explain their presence in parks. This is related to the fact that these species have a lower incidence in our parks (occurrence of 15% or less), although there are 2 exceptions: the Magpie and the Black Redstart, which were present in 55% and 40% of the parks, respectively. The Magpie is a species able to forage off parks and no models have been obtained in other studies in spite of its important occurrence (Jokimäki, 1999). The Black Redstart breeds in building holes (Mullarney et al., 2003), and the species selects some habitat characteristics not included in the current study.

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