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Bird communities of the Iberian shrubsteppes

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Bird communities of high, cold shrubsteppes (páramos) and low, warm shrubsteppes (semideserts) of the Iberian Peninsula were studied using the line-transect method. The seven censused areas are distributed from north to south approximately forming a climatic gradient along which temperature increases and precipitation decreases. *Alauda arvensis* and *Oenanthe oenanthe* are typical of páramos and *O. hispanica* and the genus *Galerida* of semideserts, while *Calandrella cinerea* is the most widely distributed passerine. Páramos tend to have high spring densities whereas semideserts have high densities and greater diversity during winter. Changes of density between spring and winter are less pronounced in semideserts, showing a relation with the temperature decrease from north to south. These tendencies agree with those found in other habitats (scrublands and forests) along a north-south transect throughout the Iberia Peninsula, indicating that distribution and abundance of the winter avifauna respond positively to increase of temperature.

Dept of Animal Biology (Vertebrates), Faculty of Biology, Univ. Complutense, 28040 Madrid, Spain.

1. Introduction

Shrubsteppes occupy large areas of the Iberian peninsula (Reyes Prosper 1915), presenting a relatively homogeneous physiognomical structure under very diverse climatic conditions. This makes shrubsteppes excellent for analysing the general patterns of geographical and seasonal variations of their bird communities in relation to climate. Nevertheless, little work has been done on the avifuana of Iberian shrubsteppes. Valverde (1958) and Suárez (1981) characterized their biogeographical structure whereas Suárez (1980), Suárez and Sáez-Royuela (1983) and Hernández and Pela (1987) published some quantitative data on shrubsteppe bird communities of the Ebro Valley.

The aims of this study are (1) to describe the breeding and wintering bird communities of Iberian shrubsteppes, (2) to analyse the relationships between the structure of these communities and some general climatic parameters (temperature, precipitation and seasonality), and (3) to compare the density of birds wintering on shrubsteppes with the density in other Iberian habitats (scrublands and forests).

2. Study areas

Seven areas were selected for study of bird densities. They are distributed from north to south, through the eastern half of Spain (Fig. 1), along a climatic gradient formed by the main Mediterranean bioclimatic stages of the Iberian peninsula: Supramediterranean (SPM), Mesomediterranean (MSM) and Thermomediterranean (TMM) (see Rivas-Martínez 1981, Tab. 1 and Fig. 1). Shrubsteppes located in warm areas are termed semideserts, and those in cold areas páramos. Thus, páramos occupy the coldest extreme (SPM) of the climatic gradient, the semideserts of the South-East the warmest (TMM) and the semideserts of the Ebro Valley (no. 4, Fig. 1) an intermediate position (MSM). Precipitation follows an inverse pattern to that of temperature (Tab. 2).

From a physiognomical point of view, the study areas have a similar vegetation structure (Suárez 1980 for Ebro Valley, and unpublished data). All are characterized by the presence of a monostratified layer of chamaephytes and grasses (10–50 cm height) sparsely covering the flatlands but they differ floristically (Tab. 1).

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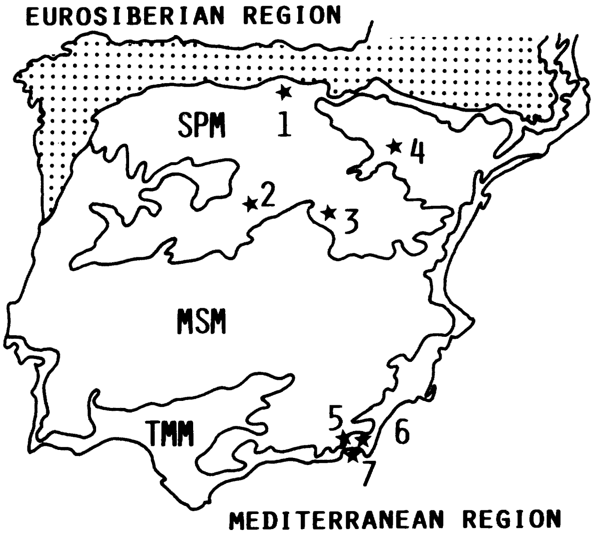

Fig. 1. Location of study areas along different bioclimatic levels (SPM, MSM and TMM) of the Iberian Mediterranean region (for areas and bioclimatic stages see Tab. 1).

Several climatic variables were selected in order to analyse the relationships between reproductive and wintering bird communities and the climate: mean winter and spring temperatures (December–January and April–June, respectively) and mean winter and spring precipitations (October–January and March–June). The periods chosen coincide with the bulk of census dates. However, precipitations from preceding months were included given their short and long-term effects on productivity (Mooney 1981, Mooney and Kummerow 1981). Each study area was described using data from one or two stations of the National Meteorological Service (Elias and Ruiz 1977). Given the scarcity of reliable records for some stations, annual variations of these climatic variables were excluded, even though some authors consider them as relevant to the organization of bird communities (Wiens 1974a, Rotenberry 1978). However, it is well known that the semideserts have very unpredictable rainfall patterns (Font 1983).

3. Methods

Line transects (Järvinen and Väisänen 1975) were carried out during the winters of 1980–81 and 1984–85 and the springs of 1981 and 1985. High sociability and low density of many steppe birds obstructed the gathering of information to estimate densities using the survey belt data (see Järvinen and Väisänen 1975). Consequently, density has been obtained by means of the main belt data (Kelker method, see Burnham et al. 1980). The survey belt data have been used to obtain indexes of abundance km^{-1} (IKA, see Ferry and Frochot 1958). Density (no. contacts 10 ha^{-1}) has been used to compare communities and IKAs (no. contacts 1 km^{-1}) to compare species abundance.

Tab. 1. Main geographical and botanical features of the areas studied. Geographical coordinates and altitude a.s.l. are approximate mean values. Bioclimatic stages according to Rivas-Martínez (1981, 1983); SPM, MSM and TMM, supramediterranean, mesomediterranean and thermomediterranean stage respectively.

Areas	Stage	Dominant vegetation (phytosociological associations)
1 Páramo of Masa 1.100 m a.s.l.	SPM	Xero-Aphyllanthion, Rivas-Goday and Rivas-Martínez 1967. Shrubsteppe of chamaephytes and some therophytes
2 Páramo of Sepúlveda 1.000 m a.s.l.	SPM	Xero-Aphyllanthion, Rivas-Goday and Rivas-Martínez 1967. Shrubsteppe of chamaephytes with hemicryptophytes grasses
3 Páramos of Alcarria 1.200 m a.s.l.	SPM	Xero-Aphyllantion, Rivas-Goday and Rivas-Martínez 1967. Vegetation very similar to area 2 with gorse belonging to Lino-genistetum pumilae, Rivas-Martínez 1967
4 Semideserts of Monegros (Ebro Valley) 380 m a.s.l.	MSM	Gypsophilion hispanicae, Braun-Blanquet and Bolós 1957 and Eremophyro-Lygeion, Braun-Blanquet and Bolós 1957 Dominant vegetation is gypsophytes replacing *Quercus coccifera* and *Juniperus thurifera*
5 Semideserts of Guadix and Gérgal 750 m a.s.l.	MSM/TMM	Rhamno-Quercion cocciferae, Rivas-Martínez 1975, Thymo-Siderition leucanthae, Bolós 1957 and Anthylliod-Salsolion papillosae, Rivas-Goday and Esteve 1965 Semiarid shrubsteppes replacing *Q. coccifera* and Chamaeropo-Rhamnetum Lyciodis Bolós 1957
6 Semideserts of Níar 120 m a.s.l.	TMM	Pleripocion angustifoliae Rivas-Martínez 1975. Shrubsteppe climax vegetation mainly substituted by esparto-grasslands belonging to Piedro-Martinezi-Stipetum tenacissimae, Rivas-Martínez and Alcaraz 1984
7 Semideserts of coastlines (Almería) 10 m a.s.l.	TMM	Periplocion angustifoliae Rivas-Martínez 1975, represented by Mayteno-Periplocetum, Rivas-Goday and Esteve 1959 association. Semiarid shrubsteppes in highly thermal areas, in direct contact with the sea climate

Tab. 2. Major climatic conditions and characteristics of bird communities in each of the study areas. Ts and Tw are spring and winter temperatures, respectively; Ps and Pw spring and winter precipitations; St, Sp and Sd temperature, precipitation and density seasonality; Ds and Dw spring and winter densities; Dwi winter density of insectivorous birds.

Areas		Climatic variables						Bird variables			
		Ts	Tw	Ps	Pw	St	Sp	Ds	Dw	Dwi	Sd
Páramos	1	12.5	3.0	215	211	76.0	1.9	15.0	9.7	0.1	35.3
	2	14.2	3.6	165	167	74.6	1.2	11.7	4.8	2.8	58.9
	3	12.3	2.5	208	141	79.7	32.2	21.0	0.9	0.5	95.7
Semideserts	4	17,2	6.9	136	116	59.9	14.7	10.7	8.8	3.3	17.8
	5	17.9	8.9	99	130	50.3	23.8	6.0	11.8	7.3	49.2
	6	18.1	11.4	120	146	37.0	17.8	11.4	8.5	7.5	25.4
	7	18.8	12.3	69	120	34.6	42.5	14.0	10.3	8.8	26.4

4. Results

4.1. Composition and structure of the communities

In breeding communities larks (F. Alaudidae) are dominant among the passerines (50–70% of birds) and *Alectoris rufa, Tetrax tetrax* and *Burhinus oedicnemus* are the most widely distributed non-passerines (Appendix 1). This largely agrees with the information given by Valverde (1958) and Suárez (1980, 1981).

The distribution of the most abundant passerines clearly delimits páramos and semideserts. The former would be characterized by the presence of *Alauda arvensis* and *Oenanthe oenanthe,* whereas *Calandrella rufescens, Oenanthe hispanica* and the genus *Galerida* would characterize the latter. All these species show disjunctive or complementary distributions (see Appendix 1), as can be deduced from the values of the Spearman's rank correlation coefficients calculated by IKAs obtained on the 7 areas: −0.741* between *O. oenanthe* and *O. hispanica,* −0.906** between *A. arvensis* and *G. theklae,* −0.684 between *A. arvensis* and *C. rufescens,* −0.684 between *A. arvensis* and *G. cristata* (for $p < 0.05$, 5 d.f., $r = 0.714$) and −0.906** between the Genus *Alauda* and *Galerida. Calandrella cinerea* is widely distributed.

During winter, non-passerines are basically represented by the same species. Larks maintain their importance among passerines (26–71% of birds) along with *Anthus pratensis* and some insectivores, viz. *Sylvia undata, Sylvia melanocephala, Saxicola torquata* and *Phylloscopus collybita* (see Appendix 2). IKAs indicate complementary variation of *Galerida* and *Alauda* along the páramo-semidesert gradient: $r = -0.811$* between *A. arvensis* and *G. cristata,* $r = -0.862$* between *A. arvensis* and *G. theklae* and $r = -0.818$ between *Alauda* and *Galerida.*

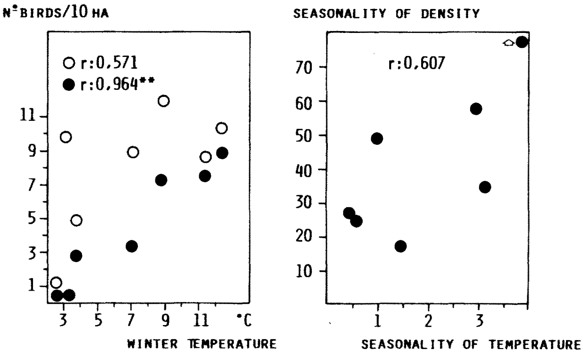

Fig. 2. Relationships between environmental variables and bird community indices. Left: open circle denotes total winter density; solid circle winter density of insectivorous.

4.2. Seasonality

In order to study the relationship between environmental and community seasonality, three variation indexes (between spring and winter) were estimated from the values in Tab. 2 (Ps, Pw, Ts, Tw, Ds and Dw):

$$Sp = \frac{(Pmax\text{-}Pmin)}{Pmax} 100$$

$$St = \frac{(Tmax\text{-}Tmin)}{Tmax} 100$$

$$Sd = \frac{(Dmax\text{-}Dmin)}{Dmax} 100$$

where P = precipitation, T = temperature, D = density of bird communities, min = minimum value and max-maximum value.

Sd decreased from páramos to semideserts (Tab. 2). In páramos all spring densities were higher compared

Tab. 3. Spearman's rank correlation coefficients between climatic variables and bird indices. For code, see Tab. 2.

Breeding season	Winter season	Seasonality
Ts-Ds: −0.535	Tw-Dw: 0.571 Tw-Dwi: 0.964**	St-Sd: 0.607
Ps-Ds: 0.571	Pw-Dw: −0.321 Pw-Dwi: −0.571	Sp-Sd: 0.036

(for $p < 0.05$ and 5d.f. r_s: 0.714).

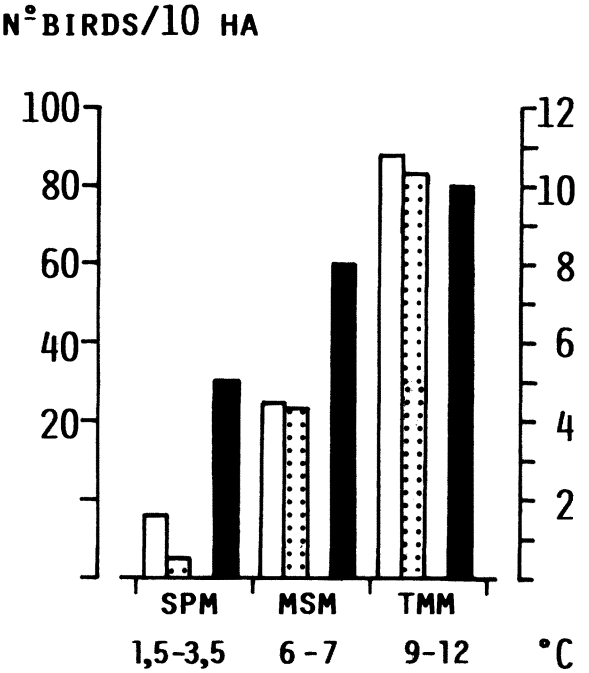

Fig. 3. Trends of winter density and temperature along different bioclimatic stages of the Iberian Mediterranean region (see Tab. 1 and Fig. 1). Values on shrubsteppe sites (in black, right scale) are the result of this study (see Tab. 2) and those on forests (in white) and shrublands (spotted) are taken from Santos and Tellería (1985; see Appendix).

with those in winter, whereas no consistent differences were found in semideserts. St also decreased from páramos to semideserts (Tab. 2), so this index was positively related to Sd (Tab. 3 and Fig. 2). However, there was no relationship between Sp and Sd.

5. Discussion

5.1. Patterns of breeding and wintering communities

The studies of Wiens and Rotenberry (Wiens 1973, 1974b, Rotenberry and Wiens 1980, Wiens and Rotenberry 1981, Rotenberry 1985) on breeding communities of grasslands and shrubsteppes of North America showed non-typical responses to the vegetation structure. Wiens (1974a) suggested that unpredictable precipitation was the cause of low densities in these communities, and pointed out that grasslands with greater precipitation have higher bird density and biomass (Wiens 1973).

The breeding patterns of bird communities in Iberian semidesert and páramo partly agree with those found in North America, i.e. both densities and precipitations are lower in semideserts than in páramos (Tab. 2).

The lack of winter climatic stress in most Mediterranean ecosystems (Di Castri 1981, Nahal 1981) makes them quite suitable as wintering grounds. After a dry summer, Mediterranean winter climates allow for vegetative and animal activity capable of supplying necessary resources for birds (Blondel 1969, Herrera 1981a, Finlayson 1981, Jordano 1985). Although this is true in coastal areas, large continental Mediterranean regions show little vegetative activity due to low winter temperatures (Aschmann 1973, Nahal 1981). Such continental conditions are common in the Iberian Peninsula (Font 1983), especially in the MSM and SPM bioclimatic stages (see Fig. 1). Santos and Tellería (1985) suggested that the increase of productivity from North to South of this gradient, should increase the availability and diversity of resources and thus the passerine abundances in southern Spain. In this area, increase of productivity mainly favours insectivorous and frugivorous birds (Finlayson 1981, Herrera 1981b, 1982, 1984, Jordano and Herrera 1981, Jordano 1985). In general, the simplest habitats, namely scrublands and grasslands, have higher bird densities in the TMM stage (see Fig. 3; Arroyo and Tellería 1984, Jordano 1985).

The community structure in shrubsteppes during winter agrees with the distribution of winter passerine abundance in the Iberian Mediterranean Region (Fig. 3). Furthermore, the high positive correlation between Tw and DWi (Tab. 3, Fig. 2) supports this finding. However, there are great differences between abundances of shrubsteppe bird communities and others throughout similar climatic gradients. Our results show a major shortage of TMM-shrubsteppes (semideserts) in comparison to other TMM-habitats in SW Spain, where winter and annual rainfalls are from 2 to 3 times higher. Therefore, these constraints can be chalked up to low plant productivity and invertebrate availability, and to the lack of plant species with fleshy fruits available during autumn–winter. Consequently, frugivorous birds are few in semideserts, where most passerines are insectivorous or granivorous (Appendix 2).

5.2. Seasonality

Community stability from one season to the next is characteristic of the semideserts in contrast to the páramos or other bird communities in TMM-habitats. Non-consistent changes in the bird numbers of semideserts contrast with the strong winter increases in grasslands, schrublands and forests of the southwestern-TMM regions (Tellería 1981, Arroyo and Tellería 1984, Costa 1984, Jordano 1985). After drought in the spring-summer season, the winter food conditions of southwestern-TMM territories make them valuable wintering grounds (see above). This is not true in semiderts where, due to low productivity year round and low autumn precipitations, density shows little seasonality.

Páramos show marked seasonality. The largest bird populations are found in spring, as is the case of other communities settled in SPM habitats with simple vegetation structures (e.g. scrublands of *Erica* and *Calluna*, see Santos and Suarez 1983), where the adverse effects of a harsh winter on productivity and food availability reduce bird numbers substantially.

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Appendix 1. Species composition, densities (D), IKAs (IKA) and size sample (in hectares and kilometers) for the breeding bird communities in seven shrubsteppe areas of Spain. For areas, see Tab. 1.

Species	Area 1		Area 2		Area 3		Area 4		Area 5		Area 6		Area 7	
	D	IKA	D	IKA	D	IKA	D	IKA	D	IKA	D	IKA	D	IKA
Buteo buteo	–	–	–	–	–	–	–	0.07	–	–	–	–	–	–
Circus pygargus	–	0.33	–	–	–	–	–	–	–	–	–	–	–	–
Falco subbuteo	–	–	–	–	–	0.24	–	–	–	–	–	–	–	–
F. tinnunculus	–	0.08	–	–	–	–	–	0.22	–	–	–	–	–	–
Alectoris rufa	–	0.17	–	0.50	0.47	0.24	–	1.31	2.90	0.60	0.16	0.39	–	0.75
Coturnix coturnix	–	–	–	–	–	–	–	–	–	–	–	0.23	–	–
Tetrax tetrax	–	0.58	–	–	–	0.35	–	–	–	–	–	0.23	0.29	0.73
Burhinus oedicnemus	–	0.41	–	–	–	–	–	0.07	–	–	–	0.23	0.58	0.58
Pterocles alchata	–	–	–	–	–	–	–	0.29	–	–	–	–	0.58	2.48
P. orientalis	–	–	–	–	0.71	0.47	–	–	–	–	–	–	–	–
Columba livia	–	–	–	–	–	–	–	0.07	–	–	–	–	–	–
C. oenas	–	–	–	–	–	–	–	0.15	–	–	–	–	–	–
Streptopelia turtur	–	–	–	–	–	–	–	0.07	–	–	–	0.23	–	2.91
Cuculus canorus	–	0.17	–	–	–	0.24	–	–	–	–	–	0.08	–	–
Athene noctua	–	–	–	–	–	–	–	0.07	–	0.12	–	0.23	–	–
Merops apiaster	–	–	–	–	–	–	–	0.22	–	0.36	–	0.39	–	–
Upupa epops	–	–	–	–	–	0.24	–	0.51	–	–	–	0.62	–	0.73
Picus viridis	–	–	–	–	–	–	–	0.15	–	–	–	–	–	–
Melanocorypha calandra	–	–	–	–	–	–	–	0.44	–	–	–	–	–	–
Calandrella cinerea	–	–	6.00	6.83	7.07	9.43	5.08	6.32	–	0.48	–	0.94	3.79	5.10
C. rufescens	–	–	–	–	–	–	1.20	2.88	–	–	1.09	2.19	1.46	1.89
Galerida cristata	–	–	–	–	–	–	0.20	0.71	–	–	–	0.50	1.24	3.87
G. theklae	–	–	1.33	2.67	–	0.35	2.14	5.87	1.45	7.13	7.5	13.39	3.72	7.50
Lullula arborea	–	–	–	0.67	–	–	–	–	–	–	–	–	–	–
Alauda arvensis	13.21	21.08	3.67	5.50	9.90	17.10	–	–	–	–	–	–	–	–
Chersophilus duponti	0.25	0.08	0.33	3.50	0.24	4.36	–	0.07	–	–	–	–	–	0.15
Sylvia melanocephala	–	–	–	–	–	–	–	–	–	–	–	0.16	0.29	0.44
S. conspicillata	–	–	–	–	–	0.24	0.58	1.83	–	–	0.94	1.48	1.17	1.75
S. undata	–	–	–	–	–	–	–	0.15	–	–	–	–	–	–
Phoenicurus ochruros	–	–	–	0.17	–	–	–	–	–	–	–	–	–	–
Saxicola torquata	0.25	1.07	–	–	–	–	–	–	–	–	–	–	–	–
Oenanthe oenanthe	0.50	0.83	–	0.50	–	0.24	–	–	–	0.12	–	–	–	–
O. hispanica	–	–	–	1.00	0.71	1.30	0.73	2.26	1.45	3.99	0.31	1.64	–	1.89
O. leucura	–	–	–	–	–	–	–	0.07	–	–	–	–	–	–
Turdus merula	–	–	–	–	–	–	–	–	–	–	–	0.16	–	–
Anthus campestris	0.50	0.66	0.33	0.17	1.89	1.53	0.15	0.15	–	–	–	0.23	–	–
Lanius excubitor	0.25	0.08	–	–	–	–	–	–	–	0.12	0.16	0.23	–	–
Emberiza calandra	–	–	–	–	–	–	–	–	–	–	0.44	2.65	–	0.44
E. cia	–	–	–	–	–	–	–	0.37	–	–	–	–	–	–
Carduelis chloris	–	–	–	–	–	–	–	–	–	1.09	–	0.31	–	0.44
C. carduelis	–	–	–	–	–	–	–	0.29	–	0.36	–	–	–	0.73
Acanthis cannabina	–	0.17	–	0.33	–	0.35	0.44	2.04	–	0.12	–	0.31	–	0.29
Serinus serinus	–	–	–	–	–	–	–	–	–	–	–	0.08	–	–
Passer domesticus	–	–	–	–	–	–	–	0.15	–	–	–	–	–	–
Petronia petronia	–	–	–	–	–	–	–	0.73	–	0.48	–	–	–	–
Corvus corax	–	–	–	–	–	–	–	0.15	–	–	–	–	–	–
C. corone	–	1.16	–	–	–	0.24	–	0.15	–	–	–	–	–	0.15
C. monedula	–	–	–	–	–	–	–	1.46	–	–	–	–	–	0.73
Pica pica	–	0.08	–	–	–	–	0.15	0.37	–	–	–	–	–	–
Pyrrhocorax pyrrhocorax	–	–	–	–	–	0.24	–	0.37	–	–	–	–	–	–
Unidentified	–	–	–	–	–	–	–	0.29	–	–	0.31	0.39	0.87	0.15
ha, km	40.1	8.0	30.0	6.0	42.4	8.5	68.5	13.7	40.1	8.0	64.1	12.8	34.3	6.9

Appendix 2. Species composition and structure of wintering bird communities in seven Spanish shrubsteppe areas (see Appendix 1).

Species	Area 1		Area 2		Area 3		Area 4		Area 5		Area 6		Area 7	
	D	IKA	D	IKA	D	IKA	D	IKA	D	IKA	D	IKA	D	IKA
Aquila chrysaetos	–	0.04	–	–	–	–	–	–	–	–	–	–	–	–
Circus cyaneus	–	0.04	–	–	–	–	–	–	–	–	–	0.12	–	–
Falco tinnunculus	–	0.09	–	–	–	–	–	–	–	0.07	–	0.12	–	–
Alectoris rufa	–	–	0.83	0.83	–	–	0.52	0.26	1.19	0.74	0.12	0.23	0.42	0.53
Coturnix coturnix	–	–	–	–	–	–	–	–	–	–	–	–	–	0.32
Vanellus vanellus	–	–	0.17	0.25	–	–	–	–	–	–	–	–	0.42	0.32
Pluvialis apricaria	–	2.19	–	–	–	–	–	–	–	–	–	–	–	–
Burhinus oedicnemus	–	–	–	–	–	–	0.13	0.06	0.59	0.45	–	–	0.21	0.32
Pterocles alchata	–	–	–	–	–	–	2.08	1.10	–	–	–	–	–	–
Athene noctua	–	–	–	–	–	–	–	–	–	0.07	–	–	–	–
Upupa epops	–	–	–	–	–	–	–	–	–	–	–	0.06	0.21	0.21
Galerida cristata	–	–	–	–	–	–	0.26	0.45	2.56	3.65	4.55	6.04	0.34	2.53
G. theklae	–	–	0.17	0.17	0.17	0.26	–	–	2.35	3.86	1.21	1.85	4.31	7.78
Alauda arvensis	6.45	14.10	0.83	0.42	0.34	0.43	2.86	4.61	–	0.22	0.12	0.12	0.21	0.21
Chersophilus duponti	–	–	–	–	–	0.09	–	–	–	–	–	–	–	–
Phylloscopus collybita	–	–	–	–	–	–	–	–	–	–	–	–	0.63	0.53
Cisticola juncidis	–	–	–	–	–	–	–	–	–	0.07	–	–	–	–
Sylvia melanocephala	–	–	–	–	–	–	–	–	–	–	0.23	0.29	0.42	1.16
S. undata	–	–	–	–	–	–	1.69	0.91	0.89	0.82	1.05	2.19	2.10	2.84
Phoenicurus ochruros	–	–	0.17	0.08	–	–	–	–	0.89	0.97	0.23	0.35	–	0.42
Saxicola torquata	–	–	–	–	–	–	0.26	0.13	–	0.15	0.12	0.23	–	0.53
Oenanthe leucura	–	–	–	–	–	–	–	0.06	–	0.07	–	–	0.21	0.11
Monticola solitarius	–	–	–	0.08	–	–	–	–	–	–	–	–	–	–
Turdus viscivorus	–	0.04	–	0.08	–	–	–	–	–	–	–	–	–	–
T. pilaris	1.78	0.79	–	–	–	–	–	–	–	–	–	–	–	–
Anthus pratensis	0.14	0.04	1.67	0.83	0.17	0.09	1.04	1.04	0.59	0.89	–	0.35	0.21	0.42
Motacilla alba	–	–	–	–	–	–	–	–	–	–	–	0.06	0.21	0.42
Lanius excubitor	–	0.04	–	0.08	0.17	0.09	–	0.06	–	0.07	0.12	0.12	–	0.21
Emberiza calandra	–	–	–	–	–	–	–	–	0.30	4.83	–	–	–	0.11
E. citrinella	1.37	0.44	–	–	–	–	–	–	–	–	–	–	–	–
E. cia	–	–	0.33	0.17	–	–	–	–	–	0.22	–	–	–	–
Carduelis chloris	–	–	–	–	–	–	–	–	–	0.07	–	0.75	–	0.53
C. carduelis	–	–	–	–	–	2.05	–	0.45	–	0.67	–	0.17	–	–
Acanthis cannabina	–	4.60	–	–	–	1.62	–	1.17	–	5.58	–	5.64	–	8.84
Serinus serinus	–	–	–	–	–	–	–	–	2.23	8.85	–	1.73	–	6.73
Fringilla coelebs	–	–	–	–	–	0.26	–	–	–	0.22	–	–	–	0.11
Petronia petronia	–	–	–	–	–	–	–	–	–	0.07	–	–	–	–
Sturnus unicolor	–	4.99	0.67	7.00	–	–	–	–	–	–	–	–	–	–
Corvus corax	–	0.04	–	–	–	–	–	–	–	0.15	–	0.06	–	–
C. corone	–	2.28	–	–	–	–	–	0.06	–	0.15	–	–	–	–
C. monedula	–	–	–	–	–	–	–	0.19	–	0.07	–	–	–	–
Pica pica	–	0.04	–	–	–	0.17	–	–	0.15	0.37	–	–	–	–
Unidentified	–	–	–	0.08	–	–	–	–	–	–	0.23	0.29	–	–
ha, km	72.9	14.6	60.0	12.0	58.6	11.7	77.1	15.4	67.2	13.5	86.9	17.4	47.5	9.5