

## BREEDING BIRDS IN NORTHWESTERN SAKAR MOUNTAIN, BULGARIA

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### Abstract

The study area is a low mountain; nevertheless it has substantial biodiversity, due to its specific location, xerothermic vegetation and positive average monthly temperatures. The study was conducted in the period 2014–2020. It determinates 35 percent of the avifauna and 58 percent of the breeding birds of Sakar Mountain. This study reports two new species for the area. It informs about 89 species assigned to a specific breeding category. Seven species assigned to a breeding category are new to the quadrant and have not been reported by previous studies. The breeding density of 13 bird species was established. The density decreases in two common birds in study area.

**Key words:** breeding density, Common Tern, Common Quail, European Turtle Dove, Ruddy Shelduck.

### Introduction

Birds are often used as indicators of biodiversity. The trends and dynamics of bird populations are often associated with other taxa, which allows the identification of important warnings for upcoming changes (Gregory et al. 2008, Gregory and van Strien 2010). Sakar Mountain is a low mountain; nevertheless it has substantial biodiversity. It has been the subject of a number of ornithological studies (Borisov 1988, Petrov et al. 1997, Milchev and Kovachev 1998, Stoychev et al. 2007). There are 253 bird species found in Sakar region, and a more extensive study conducted at the beginning of the new centu-

ry has confirmed 232 of them (Stoychev et al. 2007).

Due to its specific location between Maritsa River and Tundzha River, its xerothermic vegetation as well as the positive average monthly temperatures throughout the year, Sakar Mountain is characterized by diverse fauna and the presence of southern species (Bondev 1991, Koprarev 2002, Stoychev et al. 2007).

Despite the availability of information about Sakar avifauna, the northwestern part of the mountain within which the present study falls remains relatively poorly studied. According to Iankov (2007), 98 species have been registered in the study area.

The aim of the study is to offer an overview of the breeding birds in Northwestern Sakar Mountain and provide data on the density of some of them. The results obtained should be compared with the diversity of the birds in the rest of the Mountain in order to identify what share of the breeding birds of Sakar is located within the study area.

## Materials and Methods

The study area (UTM square MG14, 35T) encompasses the northwestern slopes of Sakar Mountain, and a small part of Maritsa River valley. Parts of two Natura protected areas fall within the scope of this study: Reka Maritsa BG 0000578 and Radinchevo BG 0002020.

The study was conducted in the period 2014–2020 (average 30 days per year). Data were collected by means of two methods: the point count method and the transect method (Bibby et al. 1992). The point count method was used in the period from April 20 to August 1 (Gruychev and Mihaylov 2019) (Fig. 1). This method was used to count the breeding density of Eurasian Collared Dove (*Streptopelia decaocto* (Frivaldszky, 1838)), European Turtle Dove (*Streptopelia turtur* (Linnaeus, 1758)), Eurasian Golden Oriole (*Oriolus oriolus* (Linnaeus, 1758)) and Common Nightingale (*Luscinia megarhynchos* (Brehm CL, 1831)). The breeding density reported by point count method was determined by 106 points in MG 14. Hundred points were positioning in the center of the 100 one-kilometer squares of MG 14. Another 6 points were

placed at the locations where the birds' song was heard less clearly (Fig. 1). Every point was visited 7 times per year. All the data from point counts method were collected in clear and quiet weather, with no rainfall, between 4:00 and 8:30 am. The breeding density by point counts was calculated by maximum number of singing birds in all annual reports (Bibby et al. 1992). Data on other species were collected from 10 transects of a total length of 44.39 km and a width of 50 m (Fig. 1).

Transects were selected in a way that represents the distribution of habitat types in the quadrant as described by Gruychev and Mihaylov (2019). Each transect was visited four times between February 15 and July 15. They were visited in the morning between 7:00 and 10:30 am. The breeding density in transects was calculated by average number of breeding pairs reported in all transects by years. The criteria used to assess breeding evidence follow Hagemajjer and Blair (1997). The taxonomy of birds used is according to Clements et al. (2019). One-way Anova was used to establish the breeding density trend of all birds.

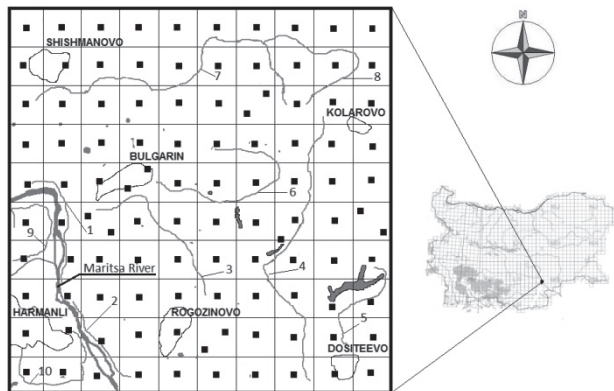


Fig. 1. Study area, points of count and transects in MG 14 (35T).

## Results

### Breeding category

The present study reported 89 species assigned to a specific breeding category (Table 1). Of these, 22 species are in the Red Data Book of the Republic of Bulgaria (Golemanski 2015), and seven species assigned to a breeding category are new

to the UTM square and have not been reported by previous studies (Stoychev et al. 2007, Iankov 2007). Ruddy Shelduck (*Tadorna ferruginea* (Pallas, 1764)) has not been reported for Sakar Mountain to this moment. A pair of birds was observed for first time on 03.04.2020. They remained in a 5.65-ha body of water characterized by shoreline vegetation overgrowth for 4 days following the date of the initial observation.

**Table 1. Breeding birds in MG 14 (T35) UTM.**

No	Species	RDB/IUCN category BG	SPEC/EU population status	Breeding cat. by Iankov (2007)	Breeding cat. this study
1	<b><i>Tadorna ferruginea</i> (Pallas, 1764)</b>	RDB/CR	3/D	x	PrB
2	<i>Anas platyrhynchos</i> Linnaeus, 1758	-	-	CB	CB
3	<i>Coturnix coturnix</i> (Linnaeus, 1758)	-	3/D	CB	CB
4	<i>Alectoris chukar</i> (Gray, JE, 1830)	RDB/EN	3/NT	CB	CB
5	<i>Phasianus colchicus</i> Linnaeus, 1758	RDB/EX	-	CB	CB
6	<i>Perdix perdix</i> (Linnaeus, 1758)	-	2/Dec	CB	CB
7	<i>Tachybaptus ruficollis</i> (Pallas, 1764)	RDB/VU	-	CB	CB
8	<i>Columba livia domestica</i> Gmelin, 1789	-	-	CB	CB
9	<i>Columba palumbus</i> Linnaeus, 1758	-	-	CB	CB
10	<i>Streptopelia turtur</i> (Linnaeus, 1758)	-	1/VU	CB	CB
11	<i>Streptopelia decaocto</i> (Frisvaldszky, 1838)	-	-	CB	CB
12	<i>Cuculus canorus</i> Linnaeus, 1758	-	-	PrB	CB
13	<i>Caprimulgus europaeus</i> Linnaeus, 1758	-	-	PrB	PrB
14	<i>Apus apus</i> (Linnaeus, 1758)	-	-	CB	CB
15	<i>Crex crex</i> (Linnaeus, 1758)	RDB/VU	2/D	PB	PB
16	<i>Gallinula chloropus</i> (Linnaeus, 1758)	-	-	CB	CB
17	<i>Burhinus oediconemus</i> (Linnaeus, 1758)	RDB/VU	3/D	PB	x
18	<i>Haematopus ostralegus</i> Linnaeus, 1758	RDB/CR	-	PrB	PB
19	<i>Vanellus vanellus</i> (Linnaeus, 1758)	-	1/VU	PB	x
20	<i>Charadrius dubius</i> Scopoli, 1786	RDB/VU	-	PrB	CB
21	<b><i>Scolopax rusticola</i> Linnaeus, 1758</b>	RDB/EN	-	x	PrB
22	<i>Ciconia nigra</i> (Linnaeus, 1758)	RDB/VU	-	CB	CB
23	<i>Ciconia ciconia</i> (Linnaeus, 1758)	RDB/VU	-	CB	CB
24	<i>Circaetus gallicus</i> (Gmelin, JF, 1788)	RDB/VU	-	CB	PrB
25	<b><i>Clanga pomarina</i> (Brehm, CL, 1831)</b>	RDB/VU	-	x	PB
26	<i>Hieraetus pennatus</i> (Gmelin, JF, 1788)	RDB/VU	-	PB	PrB
27	<i>Accipiter brevipes</i> (Severtsov, 1850)	RDB/VU	2/R	CB	PB
28	<i>Accipiter nisus</i> (Linnaeus, 1758)	RDB/EN	-	PrB	CB

No	Species	RDB/IUCN category BG	SPEC/EU population status	Breeding cat. by lankov (2007)	Breeding cat. this study
29	<i>Accipiter gentilis</i> (Linnaeus, 1758)	RDB/EN	-	PrB	CB
30	<i>Milvus milvus</i> (Linnaeus, 1758)	RDB/CR	-	PB	x
31	<i>Milvus migrans</i> (Boddaert, 1783)	RDB/VU	3/D	CB	CB
32	<i>Buteo buteo</i> (Linnaeus, 1758)	-	-	CB	CB
33	<i>Buteo rufinus</i> (Cretzschmar, 1829)	RDB/VU	-	CB	CB
34	<i>Tyto alba</i> (Scopoli, 1769)	RDB/VU	3/D	PrB	x
35	<i>Otus scops</i> (Linnaeus, 1758)	-	2/D	CB	PrB
36	<i>Bubo bubo</i> (Linnaeus, 1758)	RDB/EN	3/D	PB	x
37	<i>Athene noctua</i> (Scopoli, 1769)	-	3/D	CB	CB
38	<i>Strix aluco</i> Linnaeus, 1758	-	-	PB	x
39	<i>Asio otus</i> (Linnaeus, 1758)	-	-	CB	x
40	<i>Upupa epops</i> Linnaeus, 1758	-	-	CB	CB
41	<i>Alcedo atthis</i> (Linnaeus, 1758)	-	3/VU	PrB	PrB
42	<i>Merops apiaster</i> Linnaeus, 1758	-	-	CB	CB
43	<i>Coracias garrulus</i> Linnaeus, 1758	RDB/VU	2/Dec	PrB	PrB
44	<i>Jynx torquilla</i> Linnaeus, 1758	-	3/D	PrB	x
45	<i>Dendrocopos major</i> (Linnaeus, 1758)	-	-	PrB	CB
46	<i>Dendrocopos syriacus</i> (Hemprich & Ehrenberg, 1833)	-	-	CB	CB
47	<b><i>Dryobates minor</i> (Linnaeus, 1758)</b>	-	-	x	PrB
48	<i>Picus canus</i> Gmelin, JF, 1788	RDB/EN	-	PB	x
49	<i>Picus viridis</i> Linnaeus, 1758	-	-	CB	CB
50	<i>Falco tinnunculus</i> Linnaeus, 1758	-	3/Dec	CB	CB
51	<i>Falco subbuteo</i> Linnaeus, 1758	RDB/VU	-	CB	x
52	<i>Oriolus oriolus</i> (Linnaeus, 1758)	-	-	CB	CB
53	<i>Lanius collurio</i> Linnaeus, 1758	-	2/D	CB	CB
54	<i>Lanius minor</i> Gmelin, JF, 1788	-	2/Dec	CB	CB
55	<i>Lanius nubicus</i> Lichtenstein, MHC, 1823	RDB/VU	2/Dec	CB	CB
56	<i>Lanius senator</i> Linnaeus, 1758	-	2/Dec	CB	CB
57	<i>Garrulus glandarius</i> (Linnaeus, 1758)	-	-	PrB	PrB
58	<i>Pica pica</i> (Linnaeus, 1758)	-	-	CB	CB
59	<i>Coloeus monedula</i> Linnaeus, 1758	-	-	CB	CB
60	<i>Corvus cornix</i> Linnaeus, 1758	-	-	CB	CB
61	<i>Corvus corax</i> Linnaeus, 1758	-	-	PrB	CB
62	<i>Cyanistes caeruleus</i> (Linnaeus, 1758)	-	-	PrB	PrB
63	<i>Parus major</i> Linnaeus, 1758	-	-	CB	CB
64	<i>Remiz pendulinus</i> (Linnaeus, 1758)	RDB/VU	-	CB	x
65	<i>Calandrella brachydactyla</i> (Leiser, 1814)	RDB/VU	3/D	PrB	PrB
66	<i>Melanocorypha calandra</i> (Linnaeus, 1766)	RDB/EN	3/Dec	CB	CB
67	<i>Lullula arborea</i> (Linnaeus, 1758)	-	2/D	PrB	PB

No	Species	RDB/IUCN category BG	SPEC/EU population status	Breeding cat. by lankov (2007)	Breeding cat. this study
68	<i>Alauda arvensis</i> Linnaeus, 1758	-	3/Dec	CB	CB
69	<i>Galerida cristata</i> (Linnaeus, 1758)	-	3/Dec	CB	CB
70	<i>Iduna pallida</i> (Hemprich & Ehrenberg, 1833)	-	-	PrB	PrB
71	<b><i>Hippolais olivetorum</i> (Strickland, 1837)</b>	RDB/VU	-	x	PrB
72	<i>Acrocephalus arundinaceus</i> (Linnaeus, 1758)	-	-	PrB	PrB
73	<i>Riparia riparia</i> (Linnaeus, 1758)	-	3/D	CB	x
74	<i>Hirundo rustica</i> Linnaeus, 1758	-	3/Dec	CB	CB
75	<i>Cecropis daurica</i> (Laxmann, 1769)	-	-	CB	CB
76	<i>Delichon urbicum</i> (Linnaeus, 1758)	-	2/Dec	CB	CB
77	<i>Phyloscopus collybita</i> (Vieillot, 1817)	-	-	PrB	x
78	<b><i>Aegithalos caudatus</i> (Linnaeus, 1758)</b>	-	-	x	PB
79	<i>Sylvia atricapilla</i> (Linnaeus, 1758)	-	-	PrB	x
80	<i>Curruca curruca</i> (Linnaeus, 1758)	-	-	PrB	PrB
81	<i>Curruca hortensis</i> (Gmelin, JF, 1789)	RDB/VU	-	PB	x
82	<i>Curruca communis</i> (Latham, 1787)	-	-	PrB	PrB
83	<i>Sturnus vulgaris</i> Linnaeus, 1758	-	3/Dec	CB	CB
84	<i>Turdus merula</i> Linnaeus, 1758	-	-	CB	CB
85	<i>Erithacus rubecula</i> (Linnaeus, 1758)	-	-	PrB	PB
86	<i>Luscinia megarhynchos</i> Brehm, CL, 1831	-	-	PrB	PrB
87	<b><i>Phoenicurus ochruros</i> (Gmelin, SG, 1774)</b>	RDB/VU	-	x	PB
88	<i>Saxicola torquatus</i> (Linnaeus, 1766)	-	-	CB	PrB
89	<i>Oenanthe oenanthe</i> (Linnaeus, 1758)	-	3/D	CB	CB
90	<i>Oenanthe isabellina</i> (Temminck, 1829)	-	-	CB	x
91	<i>Oenanthe hispanica</i> (Linnaeus, 1758)	-	-	PrB	PrB
92	<i>Passer domesticus</i> (Linnaeus, 1758)	-	3/Dec	CB	CB
93	<i>Passer hispaniolensis</i> (Temminck, 1820)	-	-	CB	CB
94	<i>Passer montanus</i> (Linnaeus, 1758)	-	3/D	CB	CB
95	<i>Motacilla flava</i> Linnaeus, 1758	-	3/Dec	PrB	PrB
96	<i>Motacilla alba</i> Linnaeus, 1758	-	-	PB	PB
97	<i>Fringilla coelebs</i> Linnaeus, 1758	-	-	PrB	PB
98	<i>Coccothraustes coccothraustes</i> (Linnaeus, 1758)	-	-	PrB	PB
99	<i>Chloris chloris</i> (Linnaeus, 1758)	-	-	PrB	PB
100	<i>Linaria cannabina</i> (Linnaeus, 1758)	-	2/Dec	PrB	PB
101	<i>Carduelis carduelis</i> (Linnaeus, 1758)	-	-	PrB	PB
102	<i>Emberiza melanocephala</i> (Scopoli, 1769)	-	-	CB	CB
103	<i>Emberiza calandra</i> Linnaeus, 1758	-	2/D	CB	CB

No	Species	RDB/IUCN category BG	SPEC/EU population status	Breeding cat. by Iankov (2007)	Breeding cat. this study
104	<i>Emberiza cirius</i> Linnaeus, 1766	-	-	PrB	PrB
105	<i>Emberiza hortulana</i> Linnaeus, 1758	-	2/Dec	PrB	PrB

Note: In bold – the new species from MG14; x – species that were not registered; RDB – species in the Red Data Book of the Republic of Bulgaria/category by IUCN for Regional level (Golemanski, 2015); SPEC/EU population status according to Staneva and Burfield (2017), D – depleted, Dec – declining, NT – near threatment, R – rare, VU – vulnerable. CB, PB, PrB is breeding evidence by Hagemajjer and Blair (1997), were CB is Confirmed Breeding, PB is Possible Breeding and PrB is Probable Breeding.

Eurasian Woodcock (*Scolopax rusticola* (Linnaeus, 1758)) was often observed in the UTM square during wintering, and a mating flight was observed on 05.05.2018. In May 2015, 2016 and 2017, single birds were reported from groups of oaks.

Lesser Spotted Eagle (*Clanga pomarina* (Brehm, CL, 1831)) – a pair was observed on 10.06.2015, 13.06.2016 and 03.06.2020.

Lesser Spotted Woodpecker (*Dryobates minor* (Linnaeus, 1758)) was observed along Maritsa River on 29.06.2015, 03.06.2016, 07.06.2019 and 13.06.2020.

Olive-tree Warbler (*Hippolais olivetorum* (Strickland, 1837)) – singing birds were registered in the northwestern part of the quadrant on 04.06.2016 and 28.06.2020.

Long-tailed Tit (*Aegithalos caudatus* (Linnaeus, 1758)) – the species was registered regularly from May to July, but mostly single individuals.

Black Redstart (*Phoenicurus ochruros* (Gmelin, SG, 1774)) – registered song on 03.04.2020, on the edge of tree and shrub strips near vineyards. Nearby (100 m) there is a rocky ravine, due to which breeding is possible.

No distinct breeding category was established for 17 species, in contrast with

the findings of Stoychev et al. (2007) and Iankov (2007) (Table 1). Another six species were identified in the category of Confirmed breeding (Table 1). Two species were observed in the study area but no breeding category was established for them: Common Tern (*Sterna hirundo* (Linnaeus, 1758)) was first observed for Sakar Mountain in this study as passing. Three birds were observed on May 5 2020 perched on low trees in the middle of a pond. Two Red-footed Falcons (*Falco vespertinus* (Linnaeus, 1766)), male and female, were observed on May 17 and 18, 2017. The species is new for the UTM square; it is also registered as migrant and has not been assigned to a specific breeding category.

### Breeding density

The breeding density of 13 bird species was established (Table 2).

The breeding density decreased significantly in Common Quail ( $F = 7.67$ ,  $p = 0.0008$  (mean 1.61, SD 1.49)) and European Turtle Dove ( $F = 2.86$ ,  $p = 0.035$  (mean = 1.86, SD = 0.93)) within the research period. For the other species, no reliable trend could be observed in the study area.

Table 2. Breeding density of 13 common bird species in MG14.

Species	Breeding density, pairs/100 ha						
	2014	2015	2016	2017	2018	2019	2020
<i>Coturnix coturnix</i>	3.2 ±0.9 (1.5–4.3)	2.3 ±1.5 (1.2–4.5)	0.79 ±0.6 (0–1.4)	-	-	0.7 ±1.1 (0–2.3)	0.32 ±0.5 (0–1.1)
<i>Phasianus colchicus</i> <sup>4</sup>	-	0.5 ±1 (0–2)	0.8 ±2.3 (0–6)	0.9 ±1.4 (0–3)	1.3 ±2 (0–5)	0.5 ±0.9 (0–2)	2.1 ±0.9 (1–4)
<i>Perdix perdix</i>	0.8 ±0.5 (0–2)	0.9 ±0.9 (0–2)	1.1 ±0.9 (0–3)	1.1 ±1 (0–3)	2.8 ±1.5 (2–5)	1.7 ±1.4 (0–5)	1.02 ±1 (0–2.1)
<i>Streptopelia turtur</i> <sup>3</sup>	4.4	2.4	1.6	2.1	2.7	2.4	3
<i>Streptopelia decaocto</i> <sup>3</sup>	3.49	2.91	1.45	1.65	1.73	2.23	2.65
<i>Streptopelia decaocto</i> <sup>1,3</sup>	18.5	15.45	7.68	8.74	9.2	11.83	14.04
<i>Buteo buteo</i> <sup>2</sup>	3	4	4	5	5	6	4
<i>Oriolus oriolus</i> <sup>3</sup>	-	4.2	3.3	2.6	-	-	1.5
<i>Melanocorypha calandra</i>	-	-	-	-	2.7 ±3.1 (0–5)	10.4 ±3 (0–14)	7.8 ±5.2 (3–16)
<i>Alauda arvensis</i>	-	-	-	-	1.9 ±2.8 (0–6)	3 ±0.9 (2–4)	4.9 ±2.4 (2–9)
<i>Galerida cristata</i>	-	-	-	-	-	1.8 ±0.8 (0–3)	1.9 ±1.9 (0–5)
<i>Turdus merula</i>	-	-	-	-	5.3 ±1.3 (4–7)	3.7 ±1.5 (2–6)	3.1 ±2.3 (1–7)
<i>Luscinia megarhynchos</i> <sup>3</sup>	-	-	6.9	2.8	-	-	2.4
<i>Emberiza calandra</i>	-	-	-	-	3.9 ±1.9 (2–7)	4.5 ±2.6 (2–9)	5.2 ±2.3 (2–9)

Note: Average ±stdev. (min–max) according to data collected in all transects; <sup>1</sup> – breeding density pairs/100 ha inside Harmanli town and villages in MG14; <sup>2</sup> – reported confirmed breeding pairs in study area MG 14; <sup>3</sup> – maximum breeding pair/100 ha. <sup>4</sup> – reported birds/100ha. – insufficient data for density calculation are available. Breeding density of European Turtle Dove 2014–2016 is according to Gruychev and Mihaylov (2019).

## Discussion

The studied area covers part of the north-western slopes of Sakar Mountain and part of the Thracian lowlands (Maritsa River valley). The area has been fairly understudied in earlier research (Borisov 1988, Milchev and Kovachev 1998, Stoychev et al. 2007). During this study were reported 89 species out of a total of 253 for Sakar Mountain and 98 for the quadrant (according to Iankov 2007). Stoychev et al. (2007) reported 153 bird species assigned to a particular breeding category. In the study area 35 percent of the avifauna and 58

percent of the breeding birds of Sakar Mountain have been found. The current study reports two new species for the area, the first of which, Ruddy Shelduck, has been assigned to a breeding category, and the other one, Common Tern, has been recorded as a migrant. Common Tern is on the Endangered Species List for Bulgaria (Golemanski 2015). Today the main breeding sites of the species in Bulgaria are along Black Sea coast and along Danube (Iankov 2007, Golemanski 2015). In the past it used to breed in the Thracian lowland and along Maritsa River around Plovdiv, Harmanli and Svilengrad

(Boev et al. 1964, Mihov et al. 2007). The observation is from a small dam, 4.5 km in a straight line from Maritsa River. MG32 and LG95 squares were the closest localities of the species up until 2003 according to Iankov (2007). It is possible for the species to return to some of its old breeding sites.

The development of the breeding population of Ruddy Shelduck in Bulgaria has been in a positive direction. Many of the previous breeding sites in the northwestern part of the country have been re-occupied, and new ones are appearing in Southeastern Bulgaria (Shurulinkov et al. 2020). The present location is close to a known site (Shurulinkov et al. 2020) within the adjacent UTM square MG03. Red-footed Falcon is a new species for the quadrant registered as passing, but previous studies (Stoychev et al. 2007) have reported it as a rare breeding bird for Sakar Mountain with breeding population of 1–3 pairs. The species has been reported as common during migration.

The present study failed to record several owl species (Table 1) which have been assigned to a breeding category by Iankov (2007). No methodology for registering and counting owls was used in the study, which resulted in their rather accidental registration.

Breeding density of Common Quail and European Turtle Dove showed decrease. Stoychev et al. (2007) reported Common Quail as a common species on these sites. The breeding density of both species has been declining in Bulgaria in recent years (Spasov et al. 2017). Common Quail requires more extensive density studies in Bulgaria. The average breeding density of Turtle Dove has a continuous downward trend in the studied square, similar to that indicated for the period 2014–2016 by Gruychev and Mihaylov (2019). The trend

observed is similar to the one in the large area of the species' habitat (Wassink and Oreel 2008, Kleemann and Quillfeldt 2014, Harris et al. 2015).

## Conclusion

The present study describes the breeding avifauna in parts of Northwestern Sakar Mountain and part of Lower Thracian lowlands. It compares the results obtained to those of recent reports on this territory. This allows us to trace how the bird species composition in the studied UTM square changes. The breeding density data provided by us constitute valuable information for future research in Sakar Mountain and the region, which will make possible a comparison of density change in future.

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