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FREQUENCY, DENSITY AND NUMBERS OF SOME BREEDING BIRDS IN THE SOUTH PART OF KRESNA GORGE (SW BULGARIA)

Frekvenca, gostota in številčnost nekaterih gnezdilk južnega dela soteske Kresna (JZ Bolgarija)

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A rapid assessment of the frequency, density and numbers of breeding birds was accomplished in the south part of the Kresna Gorge, SW Bulgaria. It was based on 218 counts in 142 point transects during the breeding season of 2003. 74 species were recorded during the study. Most of the species registered have limited distribution within the area. They occupy different types of mosaic habitat where they are abundant (about 90% with relatively low frequency but almost 60% with relatively high or medium density). Local conservation status was established on the basis of frequency and numbers. Lesser Grey Shrike *Lanius minor* and Honey Buzzard *Pernis apivorus*, previously unrecorded in the Tissata natural reserve during the breeding season, were recorded, but Long–legged Buzzard *Buteo rufinus* appears to have been lost since the previous survey. Two species are apparently in decline (Rock Thrush and Olive–tree Warbler *Hippolais olivetorum*) and three (Black–headed Bunting *Emberiza melanocephala*, Rock Partridge *Alectoris graeca* and Blue Rock Thrush *Monticola solitarius*) are increasing in number.

Key words: breeding birds, frequency, density, number, point transect, Kresna Gorge, south–west Bulgaria

Ključne besede: gnezdilke, frekvenca, gostota, številčnost, točkovni transekt, soteska Kresna, jugozahodna Bolgarija

1. Introduction

The Kresna Gorge is one of the regions with the most expressive Mediterranean climatic influence in Bulgaria. The presence of Mediterranean elements in the avifauna of this region has excited the interest of ornithologists and there are a lot of papers dealing with particular observations, separate species or species composition and status (Pateff 1938, Balat 1962, Boev & Paspaleva – Andonova 1964, Michev 1968, Simeonov 1970a, Vatev & Simeonov 1978, Vatev *et al.* 1980, Simeonov & Michev 1980 & 1985, Vatev 1981, Michev & Petrov 1985, Michev *et al.* 1986 & 1988, Spiridonov & Simeonov 1988, Kouzmanov *et al.* 1995, Obuch & Benda 1996, Spiridonov 1997, Nankinov 2001, Stoyanov 2001, Stoyanov *et al.* 2001). So far there are two papers concerning the breeding bird density in some parts of the study area (Simeonov 1970b, Nanev 1988), but both were made on the basis of research carried out more than 15 years ago. In addition, the studies of Simeonov (1970b) and Nanev (1988) are more extended or more restricted, respectively, with respect to the study area – a study with recent data of breeding bird frequency, density, numbers and an assessment of their conservation status are missing. The results from such study could be very useful as a basis for future comparisons, for studying bird population trends and for nature conservation management on a local scale.

The goal of the present study is therefore to

determine the frequency, density, number and current conservation status of the diurnal breeding birds in the south part of Kresna Gorge.

2. Study area

The Kresna Gorge is situated in south–west Bulgaria between the mountains Malashevska and Pirin in the Struma River valley (Figure 1). The gorge belongs to the Continental – Mediterranean climatic zone and covers two areas. The lower parts (up to 350 m elevation) belong to the Petrich – Sandanski area and the higher parts to the Malashevski – Pirin low–mountain climatic area (Dimitrov 1966, Stanev

Figure 1: Location of the Kresna Gorge in Bulgaria

Slika 1: Lega soteske Kresna v Bolgariji

1991). The average annual temperature is 12 to 13°C with warm winters (the mean January temperature is 1 to 2°C and the minimal winter temperature is – 20°C) and very dry summers (the mean July temperature is 24°C and the maximal summer temperature is up to 38°C; Hubenov 2001). The total annual rainfall is 550 mm with a maximum at the end of autumn and the beginning of winter and a minimum at the end of summer. The duration of snow cover is usually 5 – 6 days (with depth 10 – 12 cm), but sometimes up to 15 – 20 days (with depth up to 30 – 40 cm). The rock basis is granite and the soil types are maroon, alluvial, erosive, shallow and skeletal (Hubenov 2001).

The vegetation cover of Kresna Gorge falls into the Eastern–Mediterranean province, with vegetation predominantly of the Mediterranean type, and into the xerothermal oak forest belt (Stoyanov 1966, Bondev 1982, 1991 & 1997, Velchev 1982, Velchev & Bondev 1982, Velchev & Tonkov 1986, Stoyanov D. *et al.* 2001), consisting of plant species such as Greek Juniper *Juniperus excelsa* forests and evergreen shrubs such as Prickly Juniper *Juniperus oxycedrus*, Phillyrea *Phillyrea latifolia* and other southern species such as Christ's Thorn *Paliurus spina–christi*, Almond–leafed Pear *Pyrus amygdaliformis*, Terebinth *Pistacia terebinthus* and Wild Jasmine *Jasminum fruticans*. There are also Downy Oak forests *Quercus pubescens*, plantations of Austrian Pine *Pinus nigra*, areas under cultivation, with Oriental Plane *Platanus orientalis* and White Poplar *Populus alba* along the rivers; see colour appendix. Communities of tree types with high conservation value and included in Annex I of Directive 92/43/EEC are widely presented in the area: Helleno – Balkanic riparian forests, Grecian juniper woods and Greek juniper arborescent matorrals.

The Kresna Gorge is one of the most abundant regions in Bulgaria in terms of total number of bird species registered (232) and the relative abundance of breeding bird species (135; Stoyanov *et al.* 2001). This fact is partly due to the migrating route Via Aristotelis on which the gorge lays. The Kresna Gorge belongs to the Strumsko – Mestenski zoogeographic region (Georgiev 1982 & 2002, Georgiev & Simeonov 1992). The impact of the Mediterranean climate is much more evident in this area and the percentage of Mediterranean bird species (26.5%) is higher than in the other zoogeographical regions in Bulgaria (Georgiev 2002). It is extremely high in the Tissata Natural Reserve (up to 30%; Spiridonov & Simeonov 1988). The region is also the northern limit of distribution, on the national level, of some Mediterranean bird species – Blue Rock Thrush *Monticola solitarius*, Sardinian Warbler *Sylvia melanocephala* and Rock Nuthatch *Sitta neumayer* (Hagemeijer & Blair 1997).

According to Borisov & Mihailov (1965) and Sandanski (1978) the Kresna Gorge can be divided into two parts: northern part – narrower, steep and difficult to access – and the southern part – wider and low–pitched. The latter is the subject of the present study. The study area covers 17 km^2, extending 7 km to the north of the outflow of the Vlahinska River and 1 – 2 km to the west and to the east of the Struma River (Figure 2). The altitude ranges from 188 to 880 m a.s.l. The study area includes the Tissata Nature Reserve (574.5 ha), the Tissata Important Bird Area (Kostadinova 1997) and the Tissata CORINE subsite (Spiridonov 1997).

3. Methods

The study was carried out during the breeding season of 2003 by five experienced observers, for a period of nine days fieldwork, from 15 May to 19 Jun. Days for the fieldwork were selected on the basis of the observers' availability and weather conditions – they were not

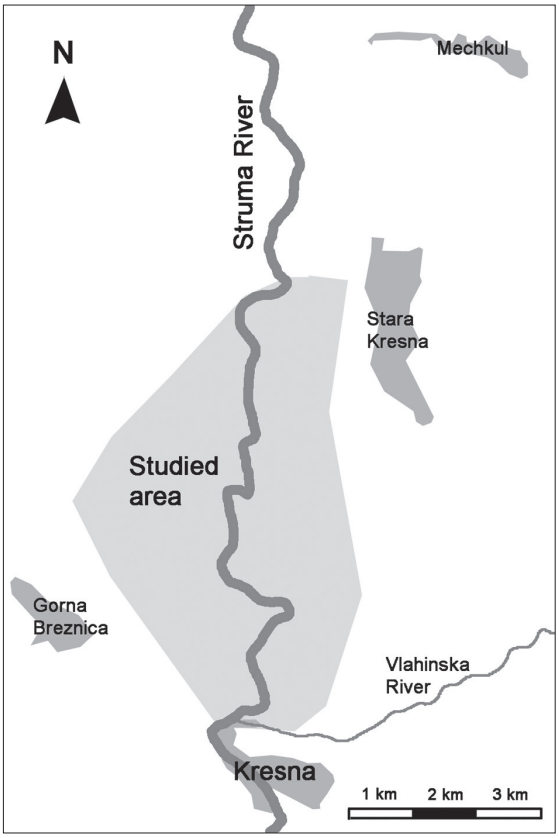

Figure 2: Location of the study area in the southern part of the Kresna Gorge

Slika 2: Lega raziskovanega območja v južnem delu soteske Kresna

chosen randomly. For the purpose of the study the method of point transects with full distance estimation was used (Bibby *et al.* 1992 & 1998, Buckland *et al.* 1998), a method previously applied in Bulgaria only by Barov (1999) and Sichanov (2002). We chose it because of three main reasons according to Bibby *et al.* (1992 & 1998) and Buckland *et al.* (1993): (1) it is often the preferred one in more fine – grained habitats; (2) in shrub habitats point transects are preferred for allowing concentration on birds without noise and the distraction of avoiding obstacles while walking; (3) it is recommended for areas with difficult access.

A total of 218 counts were made in 142 point transects. Point transect locations were selected at random in different habitat types within the area. The minimal distance between two adjacent point transects was 200 m. Counts were made 3 minutes after reaching the point at 10 minute intervals, between 6.00 and 11.00 local time in good weather conditions only. For a counting unit in the estimation of breeding bird density we chose one breeding pair, considering each of the following as its equivalent: (1) adult bird observed in a habitat suitable for breeding; (2) singing male; (3) male and female located closely; (4) flock of fledged young birds moving together with or without parents; (5) occupied nest or hollow. Flying birds were not counted. The distance to each counting unit seen or heard was recorded. 76 (53.1%) point transects were visited twice. For each species the higher number of individuals registered from the two counts was used for the density estimation. Data were analyzed by Distance 4.1 Release 2 (Thomas *et al.* 2003). Multiple covariate distance sampling analysis was applied because in our case the probability of detection was not solely a function of distance from the point, but varied by habitat and we had no stratification by habitat types (Thomas *et al.* 2003). On the basis of Akaike's Information Criterion (Akaike 1973) for minimum value selection the model of half – normal key function with cosine series expansion was used. Right truncation at the largest observed distance was made.

Numbers of breeding birds were obtained by extrapolation to the total surface of the studied area. We assessed separately and directly (without extrapolation) 21 species with limited distribution inhabiting rocks, riverside habitats and settlements.

The formula F = N x 100 / S (Djakov 1971) was applied to calculate the frequency of observed species (F – frequency; N – number of point transects where the species was registered; S – the total number of point transects). We described the breeding frequency using the scale of Petrov & Michev (1986) with some modifications: (1) extremely low frequency (ELF): under 4.99%; (2) rather low frequency (RLF): 5.00 – 14.99%; (3) low frequency (LF): 15.00 – 34.99%; (4) intermediate frequency (IF): 35.00 – 64.99%; (5) high frequency (HF): 65.00 – 84.99%; (6) rather high frequency (RHF): 85.00 – 94.99%; (7) extremely high frequency (EHF): 95.00 – 100%. Frequency was not calculated for those species for which direct assessment of numbers was made.

The local conservation status of birds was defined on the basis of juxtaposition of frequency and number. Species with higher frequency and number are considered as having lower conservation status than those with low frequency and number. On the basis of this juxtaposition, the bird species were classified into three groups. The first group consists of species with relatively high frequency and number, the second with intermediate frequency and medium to high number, and the third group with low frequency and number. The present study does not consider Corncrakes *Crex*

crex, Owls Strigiformes and Nightjar *Caprimulgus europaeus*, which involve special methods of count because of their night activity, or certain species with very low abundance, for which special research is required.

4. Results

We registered 74 species in the study area during the breeding season of 2003, constituting 55% of the previously determined breeding avifauna of the Kresna Gorge (Stoyanov *et al.* 2001). Regarding the breeding bird diversity, we registered more than 4 breeding species per square kilometre for the studied area. During the point counts 47 species were recorded and their frequency determined (Table 1). 18 species have extremely low frequency, 11 rather low frequency, 13 low frequency, 5 intermediate frequency and none with high frequency. The most frequent species were Chaffinch *Fringilla coelebs* and Golden Oriole *Oriolus oriolus*, followed by Nightingale *Luscinia megarhynchos*, Blackbird *Turdus merula*, Great Tit *Parus major* and Ortolan Bunting *Emberiza hortulana* (Table 1). We estimated the breeding density for 26 species; there was insufficient data for the rest. The numbers of these species were calculated on the basis of the calculated density. Although there was insufficient data for the rest, we made a rough direct assessment of numbers for some of them.

The most abundant species (density above 20 pairs/km^2) were the Olivaceous Warbler *Hippolais pallida*, and Chaffinch followed by Great Tit, Goldfinch *Carduelis carduelis* and Hawfinch *Coccothraustes coccothraustes* (Table 1). 5 more species were observed at comparatively high density (15 – 20 pairs/km^2): Rock Bunting *Emberiza cia*, Turtle Dove *Streptopelia turtur*, Nightingale, Sombre Tit *Parus lugubris* and Long–tailed Tit *Aegithalos caudatus*. There were 5 species with intermediate density (10 – 15 pairs/km^2), 6 with low density (5 – 10 pairs/km^2) and 5 with rather low density (D < 5 pairs/km^2). We registered a further 28 bird species out of point transects or flying above them. For 17 of these we made a reliable direct estimation of numbers (Table 2). We could not estimate the density or number of breeding pairs for the Alpine Swift *Tachymarptis melba*, Middle Spotted Woodpecker *Dendrocopos medius*, Crested Lark *Galerida cristata*, Short–toed Lark *Calandrella brachydactyla*, Black Redstart *Phoenicurus ochruros*, Lesser Whitethroat *Sylvia curruca*, Sardinian Warbler (P. Iankov *pers. comm.*), Willow Tit *Parus montanus*, Rock Nuthatch or Tree Sparrow *Passer montanus* because they were observed only once or twice during our survey, insufficient for reliable estimations.

Regarding European conservation status, we observed 14 species (Honey Buzzard *Pernis apivorus*, Short–toed Eagle *Circaetus gallicus*, Golden Eagle *Aquila chrysaetos*, Peregrine Falcon *Falco peregrinus*, Kingfisher *Alcedo atthis*, Middle – spotted Woodpecker, Syrian Woodpecker *Dendrocopos syriacus*, Woodlark *Lullula arborea*, Tawny Pipit *Anthus campestris*, Olive–tree Warbler *Hippolais olivetorum*, Red–backed Shrike *Lanius collurio*, Lesser Grey Shrike *L. minor*, Masked Shrike *L. nubicus*, Ortolan Bunting) included in Annex I of Directive 79/409/EEC on the conservation of wild birds.

Regarding local conservation status, three groups of birds were defined using data from breeding frequency and number. The first group consists of Chaffinch, Great Tit and Nightingale. These species inhabit different types of habitats and they are common and abundant, not only in the study area but also on the national level and are not a conservation priority (Hagemeijer & Blair 1997, BirdLife International 2004). The second group comprises Turtle Dove, Olivaceus Warbler, Blackbird, Woodchat Shrike *Lanius senator*, Hawfinch, Rock Bunting, Ortolan Bunting, Black–headed Bunting *Emberiza melanocephala* and Corn Bunting *Miliaria calandra*. Some of these species (Olivaceous Warbler, Woodchat Shrike, Rock and Black–headed Buntings) are important from a conservation point of view because they are not so widespread and numerous on the national level although they are present in high numbers in the studied area. They are also included in Annex II of the Bern Convention. The third group includes the majority of the species observed. This group is of higher conservation importance, particularly regarding some species with limited distribution – the Rock Partridge *Alectoris graeca*, Black–eared Wheatear *Oenanthe hispanica*, Orphean Warbler *Sylvia hortensis* and Blue Rock Thrush, which are included in the Bern Convention. Other species – Chiffchaff *Phylloscopus collybita*, Willow Tit *Parus palustris* and Lesser Grey Shrike are common on the national scale and are important only regarding the local biodiversity because of their low number in the area.

5. Discussion

This study is a rapid assessment of the current status of the local breeding populations and does not claim to be exhaustive, because it does not consider all the breeding bird species in the study area. The results show that all the species registered belong only to the

Table 1: Frequency, density and numbers of some breeding birds in the south part of the Kresna Gorge. Frequency (F) was estimated using the formula of Djakov (1971). Frequency categories are described following Petrov & Michev (1986) with some modifications. Density and number of breeding pairs with their coefficient of variation and confidence intervals are computed using the program Distance (Thomas *et al.* 2003).

Tabela 1: Frekvenca, gostota in številčnost nekaterih gnezdilk v južnem delu soteske Kresna. Frekvenca (F) je bila ocenjena z uporabo formule po Djakovu (1971). Kategorije frekvence so z nekaterimi modifikacijami uporabljene po Petrovu & Michevu (1986). Gostota in število gnezdečih parov s koeficienti variacije in intervalom gotovosti sta bila izračunana z uporabo programa Distance (Thomas *et al.* 2003)

	Frequency / Frekvenca		Density / Gostota			No. of breeding pairs/ Št. gnezdečih parov	
Species / Vrsta	F [%]	Category/ Kategorija	Breeding pairs/ Gnezdečih parov / km^2	Coef. of var. [%]/ Koef. var. [%]	95% Conf. Int./ 95% interval gotovosti	95% Conf. Int./ 95% interval gotovosti	Estimated / Ocena
Alectoris graeca	4.9	ELF					20 – 30
Columba palumbus	2.8	ELF					25 – 35
Streptopelia turtur	29.6	LF	17.6	17.7	12.4 – 24.9	212 – 423	299
Cuculus canorus	12.7	LF					20 – 25
Upupa epops	8.5	RLF					60 – 80
Picus viridis	2.8	ELF					25 – 35
Dendrocopos syriacus	15.5	LF					100 – 150
Lullula arborea	9.2	RLF	5.7	40.1	2.6 – 12.4	45 – 210	97
Anthus campestris	1.4	ELF					10 – 20
Motacilla alba	3.5	ELF					
Erithacus rubecula	2.1	ELF					30 – 40
Luscinia megarhynchos	53.5	IF	16.7	10.6	13.5 – 20.5	230 – 349	283
Oenanthe hispanica	10.6	RLF	4.4	30.9	2.4 – 8.0	41 – 136	75
Monticola saxatilis	1.4	ELF					
M. solitarius	5.6	RLF	1.1	49.0	0.4 – 2.8	8 – 48	19
Turdus merula	40.8	IF	6.3	14.0	4.8 – 8.2	81 – 140	107
T. viscivorus	2.1	ELF					50 – 70
Hippolais pallida	23.9	LF	49.7	20.1	33.6 – 73.6	571 – 1250	845
Sylvia cantillans	4.2	ELF					
S. hortensis	4.9	ELF	6.1	47.0	2.5 – 14.9	42 – 253	103
S. communis	14.1	RLF	12.2	24.7	7.5 – 19.7	128 – 335	207

Continuation of Table 1 / nadaljevanje tabele 1

	Frequency / Frekvenca		Density / Gostota			No. of breeding pairs/ Št. gnezdečih parov	
Species / Vrsta	F [%]	Category/ Kategorija	breeding pairs km^2/Gnezdečih parov km^2	Coef. of var. [%]/ Koef. var. [%]	95% Conf. Int./ 95% interval gotovosti	95% Conf. Int./ 95% interval gotovosti	Estimated / Ocena
S. atricapilla	12.7	RLF	2.90	29.1	1.7 – 5.1	28 – 87	50
Phylloscopus collybita	2.1	ELF					13-23
Muscicapa striata	2.8	ELF					50 – 70
Parus palustris	1.4	ELF					15 – 25
P. lugubris	15.5	LF	15.36	23.8	9.7 – 24.4	164 – 415	261
P. caeruleus	3.5	ELF					40 – 60
P. major	40.1	IF	23.86	13.1	18.4 – 30.9	313 – 525	406
Aegithalos caudatus	12.7	RLF	15.20	25.5	9.3 – 25	158 – 425	260
Sitta europaea	7.0	RLF					60 – 80
Oriolus oriolus	61.3	IF	11.05	10.3	9.0 – 13.5	153 – 230	188
Lanius collurio	13.4	RLF	8.50	26.6	5.1 – 14,2	86 – 242	144
L. minor	1.4	ELF					2 – 4
L. senator	20.4	LF	12.20	22.2	7.9 – 18.8	135 – 320	208
L. nubicus	1.4	ELF					
Garrulus glandarius	21.8	LF	5.00	20.6	3.3 – 7.4	56 – 126	84
Sturnus vulgaris	4.2	ELF					
Fringilla coelebs	64.8	IF	43.70	9.6	36.2 – 52.7	615 – 896	743
Carduelis chloris	13.4	RLF	4.00	26.7	2.4 – 6.8	41 – 116	69
C. carduelis	15.5	LF	23.10	22.3	14.9 – 35.7	254 – 606	392
C. cannabina	2.8	ELF					
Coccothraustes coccothraustes	20.4	LF	21.60	19.3	14.8 – 31.6	252 – 536	368
Emberiza cirlus	12.7	RLF	4.20	32.0	2.2 – 7.8	38 – 132	71
E. cia	27.5	LF	19.50	17.3	13.9 – 27.3	236 – 464	331
E. hortulana	31.0	LF	8.50	16.7	6.1 – 11.8	104 – 201	145
E. melanocephala	20.4	LF	14.20	20.6	9.5 – 21.3	161 – 361	242
Miliaria calandra	26.8	LF	12.00	16.6	8.6 – 16.6	147 – 281	203

categories of low and intermediate frequency (Table 1). This could be explained by the high diversity of fine–grained habitats and by the fact that point transects were not limited to separated habitats but dispersed randomly in different combinations of the habitats present in the study area.

We could not compare our results for the breeding bird density with those of Simeonov (1970) because of the different methods applied. There are only fragmentary data concerning the number of certain rare or endangered species in the study area (Spiridonov 1997) so we could not compare all of our results. However we found some changes in the species composition and number in the Tissata Nature Reserve and Tissata Important Bird Area over the last seven years. We registered two breeding pairs of Lesser Grey Shrikes in the buffer zone of the Tissata natural reserve and one pair of Honey Buzzards, neither of which were reported by Spiridonov & Simeonov (1988). The Long– legged Buzzard *Buteo rufinus*, reported as breeding in the area, (Spiridonov 1997) was not observed during our study. We registered an increase in number of 3 species and decrease of 2 species. Spiridonov (1997) reported 20 breeding pairs of Black–headed Buntings and 4 – 5 breeding pairs of Rock Partridge and Blue Rock Thrush. According to our results the current number of these species is about 200 pairs of Black–headed Buntings and about 20 pairs of Rock Partridges and Blue Rock Thrushes. On the other hand Spiridonov (1997) estimated that the number of Rock Thrushes and Olive–tree Warblers was 10 and 50 pairs respectively, but our estimate indicates half that number at most.

Table 2: Directly estimated numbers of bird species observed outside point transects. The number of pairs is the minimal number of breeding pairs found within the study area according to the definition of "breeding pair" (see Methods). The number of estimated pairs is the largest number of pairs that probably breed within the study area according to the authors' estimate, made on the basis of all individuals observed.

Tabela 2: Ocena številčnosti vrst, najdenih zunaj točkovnega popisa. Število parov je minimalno število parov, najdenih med raziskavo, ki so ustrezali kriterijem za gnezditev. Avtorja sta optimalno število parov ocenila glede na število vseh opazovanih ptic.

Species / Vrsta	No. of breeding pairs/ Št. gnezdečih parov	
	Observed/ Opazovani	Estimated/ Ocena
Pernis apivorus	1	1
Circaetus gallicus	1	0 – 1
Accipiter nisus	2	2 – 4
Buteo buteo	3	2 – 4
Aquila chrysaetos	1	1
Falco tinnunculus	2	1 – 3
F. peregrinus	1	0 – 1
Actitis hypoleucos	4	4 – 6
Alcedo atthis	1	1 – 2
Hirundo rupestris	15	15 – 20
H. rustica	13	13 – 25
H. daurica	50	50 – 70
Delichon urbica	25	25 – 50
Motacilla cinerea	2	2 – 5
Cinclus cinclus	1	1 – 2
Corvus corone	2	1 – 3
C. corax	1	1

We conclude that most of breeding bird species registered have a limited distribution, inhabiting different types of mosaic habitats where they are relatively abundant. This makes them very sensitive to destruction of their habitat patches and makes the bird diversity of the region very vulnerable in the case of sudden landscape changes in the area.

The present study is the first research to be published using the point count technique (Bibby *et al.* 1992 & 1998, Buckland *et al.* 1993) and Distance software (Thomas *et al.* 2003) in Bulgaria. It is also the only one showing quantitative data for the majority of the breeding avifauna in the Kresna gorge that could be used as a basis for tracking population trends in this Important Bird Area / IBA (Kostadinova 1997) and the Tissata nature reserve. We view with apprehension any realization of the idea for enlargement of the highway along the Kresna gorge, since this will have negative effects on the most of the bird species, mainly those belonging to the third group regarding local conservation status (see Results). We would like to recommend quantitative studies on nocturnal birds as Corncrake, Nightjar and Owls that were not estimated during the present study and also on some passerines with high nature conservation status (Hagemeijer & Blair 1997, BirdLife International 2004) and those with low frequency, such as Olive–tree Warbler, Sardinian Warbler and Masked Shrike for which special census methods have to be applied.

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Povzetek

Avtorja sta napravila oceno frekvence, gostote in številčnosti gnezdilk v južnem delu soteske Kresna, JZ Bolgarija, in sicer na osnovi 218 štetij v 142 točkovnih transektih v gnezditvenem obdobju leta 2003. Popisala sta skupno 74 vrst, ki so na tem območju razširjene večinoma lokalno, a z visoko gostoto (90% vrst ima nizko frekvenco, 60% relativno visoko gostoto). Na podlagi podatkov sta ocenila tudi varstveni status območja. Najdena sta bila črnočeli srakoper *Lanius minor* in sršenar *Pernis apivorus*, ki prej nista bila znana kot gnezdilca rezervata Tissata. Med raziskavo pa ni bila odkrita rjasta kanja *Buteo rufinus*, ki je bila v tem območju znana iz prejšnjih raziskav. Dve vrsti številčno očitno upadata (slegur *Monticola saxatilis* in oljčni vrtnik *Hippolais olivetorum*), tri pa se povečujejo (črnoglavi strnad *Emberiza melanocephala*, kotorna *Alectoris graeca* in puščavec *Monticola solitarius*).

References

Akaike, H. (1973): Information theory and an extension of the maximum likelihood principle. pp. 267–281 In: Petran, B. & Csàaki, F. (eds.) International Symposium on Information Theory, 2nd edn. Akadèemiai Kiadi, Budapest, Hungary.

Balat, F. (1962): Contribution to the knowledge of the avifauna of Bulgaria. – Prace Brn. Zak. Čav. 34 (10): 445 – 459.

Barov, B. (1999): Ecological characteristics of ornithocenosis, inhabiting xerotermous oak forests in the region of the Biala River, Eastern Rodopes. – Sofia Univ. "st. Kl. Ohridski", Faculty of biology, Section "Ecology and environmental protection", M. S. thesis. (in Bulgarian)

Bibby, C. J., Burgess N.D. & Hill D.A. (1992): Bird Census Techniques. – Academic Press, London.

Bibby, C., Jones, M. & Marsden, S. (1998): Expedition Field Techniques. Bird Surveys. – Expedition Advisory Centre, London.

BirdLife International (2004): Birds in Europe: Population estimates, trends and conservation status. Cambridge. BirdLife Conservation Series No. 12. BirdLife International, Cambridge.

Boev, N. & Paspaleva–Andonova, M. (1964): [Contribution for the survey of the Black Strok (*Ciconia nigra* L.) in Bulgaria]. – News of the Inst. of zool. with museum 16: 5 – 16 (in Bulgarian).

Bondev, I. (1982): Fitogeographical regions in Bulgaria. pp. 443–451. In: Geography of Bulgaria, Vol 1. Physical geography. – BAS, Sofia.

Bondev, I. (1991): The vegetation of Bulgaria. Map 1 : 600 000 with explanatory text. – St Kliment Ohridski University Press, Sofia.

Bondev, I. (1997): Geobotanical zoning. pp. 238–304 In: Geography of Bulgaria, Vol. 1. Physical geography. – BAS, Sofia.

Borisov, Z. & Mihailov, Tz. (1965): Along the Sruma River. – Science and art, Sofia.

Buckland, S.T. (1987): On the variable circular plot method of estimating density. – Biometrika 43: 363–384.

Buckland, S.T., Anderson, D.R., Burnham, K.P. & Laake, J.L. (1993): Distance Sampling: Estimating abundance of biological populations. – Chapman & Hall, London.

Dimitrov, D. (1966): Climatic division of Bulgaria. pp. 262–293 In: Geography of Bulgaria, Vol 1. – BAS, Sofia. (in Bulgarian)

Djakov, J. (1971): About identificating bird species abundance according to their frequency. – Scientific Conference, Smolensk: 301–308.

Georgiev, V. (1982): Zoogeographical regions on the basis of the terrestrial fauna. pp. 472–477 In: Geography of Bulgaria, Vol 1. – BAS, Sofia. (in Bulgarian)

Georgiev, V. (2002): Zoogeographic regioning. p.p 373–375, In: Kopralev, I. (ed.) Geography of Bulgaria. – ForCom, Sofia. (in Bulgarian)

Georgiev, V. & Simeonov, S. (1992): [Zoogeographical characteristic of the breeding birds in Bulgaria] – Annual of Sofia Univ. "St. Kliment Ohridski", Facuty Of Biology, Book 1 – Zoology, 80: 200–210. (in Bulgarian)

Hagemeijer, E. & Blair, M. eds. (1997): The EBCC Atlas of European Breeding Birds: Their Distribution and Abundance. – T & A D Poyser, London.

Hubenov, Z. (2001): Physicogeographical characteristic of Kresna Gorge (SW Bulgaria). pp. 7–22. In: Beron, P. (ed.): Biodiversity of Kresna Gorge (SW Bulgaria). – National Museum of Natural History, Sofia. (in Bulgarian)

Kostadinova, I. (1997): Important bird areas in Bulgaria. – BSPB, Conservation Series – Book 1, Sofia. (in Bulgarian)

Kouzmanov, G., Todorov, R. & Stoyanov G. (1995): Information sur la repartition et la situation des rapaces nocturnes en Bulgarie. Newsletter of the World Working Group on Birds of Prey and Owls (WWGBP) 21/22: 14–17.

Michev, T. (1968): About the distribution and breeding biology of the Egiptian Vulture (*Neophron percnopterus* L.) in Bulgaria. – Bull. of the Inst. of zool. with museum 27: 65–79. (in Bulgarian)

Michev, T. & Petrov, Tz. (1985): Distribution and number of the Saker Falcon, *Falco cherrug* Gray, 1834 in Bulgaria. – International symposium "Protection of natural areas and the genetic fund they contain". Project No. 8 on the programme "Man And Biosphere" (MAB) of UNESCO, Collection of reports, BAS, Sofia. (in Bulgarian)

Michev, T., Petrov, Tz., Profirov, L. & Spiridonov, J. (1986): Contribution for the distribution and number of the Raven (*Corvus corax* (L.) in Bulgaria between 1950 and 1984. – Ecology 19: 27–35. (in Bulgarian)

Michev, T., Petrov, Tz., Profirov, L. & Gavrailov, S. (1988): Distribution and nature defensive status of the Golden Eagle *Aquila chrysaetos* (L.), 1758 in Bulgaria. – Bull. of the museums of south Bulgaria 15: 79–87. (in Bulgarian)

Milchev, B. (1991): Ornithocenological study in the Strandja mountains in Bulgaria. – Sofia University "St. Kl. Ochridski", Faculty of biology, Section of zoology and antropology, dissertation. (in Bulgarian)

Nanev, K. (1988): [About the number of some mediterrenian bird species in the south part of Kresna Gorge]. – Orn. Inf. Bull. 23/24: 106–108 (in Bulgarian)

Nankinov, D. (1982): Ecological review of the birds of "Kastrakli" Natural reserve and Trigradsko – Yagodinski region of the Rodopes. – Ecology 10: 22–34.

Nankinov, D. (1997): Composition of the avifauna of the Sylver Pine ecosystems. – Forest science 3/4: 84–95.

Nankinov, D. N. (2001): About the first and following observations of the Masked shrike (*Lanius nubicus* Lichtenstein) in Bulgaria. V: Geoecological and bioecological problems of the North Black Sea Coast. Proceeding of International Conference. Tiraspol, March 28–30, 2001. – EPD DSU – ECODNIESTER, Tiraspol.

Nikolov, S. & Vassilev, V. (2004): Census of breeding birds in the Ponor Mountains, western Bulgaria. – Bird Census News 16(2), *in print*.

Obuch, J. & Benda, P. (1996): Contribution to the feeding ecology of *Strix aluco* and *Bubo bubo* (Aves: strigiformes) in southwestern Bulgaria. – Acta Soc. Zool. Bohem. 60 (1): 43–49.

Pateff, P. (1938): Die geographische Verreitung der Vögel in Bulgarien. – IX Congres ornith. intern. Rouen 1983: 257–283.

Petrov, T. & Michev, T. (1986): Upon defining the nature protective status of birds according to their frequency and abundance. – Bull. of the museums of South Bulgaria 12: 43–48.

Sandanski, B. (1978): The Kresna Gorge. – Medcine & Sports, Sofia.

Sichanov, D. (2002): Ornithocenological analysis of some habitats with conservational importance in the Rilski Monastery Natural Park. – Sofia Univ. "St. Kl. Ohridski", Faculty of biology, Section "Ecology and environmental protection", M.S. thesis. (in Bulgarian)

Simeonov S. (1970a): Uber Verbreitung meditrraner Vogelarten in Bulgarien. – Die Vogelwelt 2: 59–67.

Simeonov S. (1970b): Study of breeding avifauna in pseudomaquis plant communities in the Pirin Mountains. – Annual of Sofia Univ. "St. Kl. Ohridski", Faculty of biology, Book 1 – Zoology, 63: 15–26.

Simeonov, S. (1971): Ornithocenological research in Pirin Mountains. – Sofia University "St. Kl. Ochridski", Faculty of biology, dissertation. (in Bulgarian)

Simeonov, S. (1986): The birds of Pirin Mountains. pp. 7 – 22 In: Fauna of southwest Bulgaria, Vol 2. – BAS, Sofia. (in Bulgarian)

Simeonov, S. & Michev, T. (1980): Investigation of the distribution and number of the Red–rumped Swallow *Hirundo daurica rufula* (Temminck) in Bulgaria. – Ecology 7: 84–93. (in Bulgarian)

Simeonov, S. & Michev, T. (1985): On the present distribution and abundance of the Eagle Owl (*Bubo bubo* (L.) in Bulgaria. – Ecology 15: 60–65. (in Bulgarian)

Spiridonov Z. (1997): Tissata. pp. 49–50 V: Kostadinova, I. (ed.): Important Bird areas in Bulgaria, Conservation Series of BSPB, Vol 1. – BSPB, Sofia.

Spiridonov, Z. & Simeonov, P. (1988): Studies on the nesting ornithofauna of the "Tisata" reserve. pp. 23–29 In: Fauna of Southwestern Bulgaria, Vol 2. – BAS, Sofia. (in Bulgarian)

Stanev, S. (1991): Climatic zones and areas in Bulgaria. pp. 53– 9 In: The climate of Bulgaria. – BAS, Sofia.

Stoyanov, N. (1966): Vegetation cover. pp. 445–482 In: Geography of Bulgaria, Vol 1. Physical geography. – BAS, Sofia.

Stoyanov, G. (2001): Die Maskengrasmücke – eine neue Art für die bulgarische Ornithofauna. – Orn. Mitt. 53 (10): 336–338.

Stoyanov, G., Kotsakov, G., Todorov N. & Bojilov, V. (2001): Species composition, occurrence and conservation status of the ornithofauna in Kresna Gorge (SW Bulgaria). pp. 305–323. In: Beron, P. (ed.): Biodiversity of Kresna Gorge (SW Bulgaria). – National Museum of Natural History, Sofia. (in Bulgarian)

Stoyanov, D., Petrova, S., Petrova, L. & Kovatchev, A. (2001): Flora and vegetation of Kresna Gorge (SW Bulgaria). pp. 23–30 In: Beron, P. (ed.): Biodiversity of Kresna Gorge (SW Bulgaria). – National Museum of Natural History, Sofia. (in Bulgarian)

Thomas, L., Laake, J.L., Strindberg, S., Marques, F.F.C., Buckland, S.T., Borchers, D.L., Anderson, D.R., Burnham, K.P., Hedley, S.L., Pollard, J.H. & Bishop, J.R.B. (2003): Distance 4.1. Release "2". Research Unit for Wildlife Population Assessment, University of St. Andrews, UK. http://www.ruwpa.st – and.ac.uk/distance/

Vatev, I. (1981): [Rare birds in Kresna Gorge] . – Nature protection 7: 14–15. (in Bulgarian)

Vatev, I. & Simeonov, P. (1978): [Notes for some birds found in the south part of Kresna Gorge]. – Orn. Inf. Bull. 4: 15–20. (in Bulgarian)

Vatev, I., Simeonov P., Michev, T. & Ivanov, B. (1980): The Masked shrike (*Lanius nubicus* Lichtenstein) – a breeding species in Bulgaria. – Acta zool. bulg. 15: 115 – 118. (in Bulgarian)

Velchev, V. (1982): Mediterranean vegetation. Vegetation zones. pp. 434–439 In: Geography of Bulgaria, Vol. 1. Physical geography. – BAS, Sofia. (in Bulgarian)

Velchev, V. & Bondev, I. (1982): Xerothermous oak forests belth. pp. 439–440 In: Geography of Bulgaria, Vol. 1. Physical geography. – BAS, Sofia. (in Bulgarian)

Velchev, V. & Tonkov, S. (1986): Vegetation and flora of Southwestern Bulgaria. pp. 20–43 In: Fauna of Southwestern Bulgaria, Vol 1. – BAS, Sofia.

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Figure 1: Typical habitats of the southern part of the Kresna Gorge: rocky slopes and formations of Greek Juniper *Juniperus excelsa* and Christ's Thorn *Paliurus spina–christi* situated above riparian forests of Oriental plane *Platanus orientalis* and White poplar *Populus alba* (photo: S. Spasov) – see page 23–31

Slika 1: Značilni habitati v južnem delu Soteske Kresna: kamnita pobočja in sestoji grškega brina *Juniperus excelsa in* kristusovega trna *Paliurus spina–christi* nad obrežnimi gozdovi vzhodne platane *Platanus orientalis* in belega topola *Populus alba* (foto: S. Spasov) – glej stran 23–31

Figure 2: Glossy Ibises *Plegadis falcinellus* on 14 Apr 2005 near the church at Črna vas, Ljubljansko barje, central Slovenia (photo: D. Šere) – see page 47

Slika 2: Plevica *Plegadis falcinellus* dne 14.4.2005 blizu cerkve v Črni vasi na Ljubljanskem barju (foto: D. Šere) – glej stran 47