Kurzmitteilung

Eagle Owl *Bubo bubo* diet indicates new localities of poorly known and threatened breeding birds in Bulgaria

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Pellet and feather analyses of the Eagle Owl diets in 41 localities in SE Bulgaria indicated 144 (75.8 %, n = 190) new and 46 (24.2 %) affirmative records of ten poorly known and threatened bird species during their breeding period in 1994-2013. This result confirms the efficiency of Eagle Owl diet for studying birds with a cryptic coloration and mainly nocturnal activity. The distribution of the most studied bird species are related to the preservation of many small reservoirs as one of their main breeding habitats in SE Bulgaria. Concentration of eight and nine species in four UTM squares, which are also important for the conservation of some protected small mammals, designated the potential areas for new Natura 2000 sites in Bulgaria.

Key words: Eagle Owl *Bubo bubo*, pellet-analysis, breeding distribution, bird protection, Natura 2000

1. Introduction

Eagle Owl is an opportunistic generalist that feeds on a great variety of vertebrate and some larger invertebrate animals, but prefers mammals and birds with biomass between 200 and 1,900 g. Bones in owl pellets are good preserved as a result of the higher pH of the gastric fluid about 2.35, compared with 1.6 in hawks, and their identification presents the real composition of the owl diet. The Eagle Owl as a nocturnal top predator includes in its diet many animals with crepuscular and night activities, often with a secret behaviour (Glutz von Blotzheim & Bauer 1994, Marks *et al.* 1999, Mebs & Scherzinger 2000). The diets of Eagle owls therefore have been repeatedly used in studies on the biodiversity and its protection in Bulgaria (Baumgart & Stephan 1972, Popov & Milchev 2001, Menzel & Milchev 2001, 2007, Miltschev *et al.* 2002, Milchev & Kovachev 2005, Miltschev & Sivkov 2006, Milchev & Georgiev 2012, Milchev & Boev 2014).

The present study aims to give new data for nine poorly known and threatened bird species with mainly secretive behaviour, cryptic coloration and nocturnal activity during the breeding period by analysis of Eagle Owl diet, with a view to their better knowledge and protection in Bulgaria. The Little Grebe *Tachybaptus ruficollis* was used for comparison as a much easier detectable breeding bird also in small reservoirs in the study region.

2. Material and Methods

The study area includes a mainly hilly and plane territory of around 10,000 km^2 in southeastern Bulgaria. The Black Sea coast is its eastern border and the Bulgarian-Turkish border marks the southern one. The rivers of Maritza and Sazliyka outline its border on the west and the northern slopes of St. Iliyski, Bakadzhitsite and Hisar Hills are its northern border (Fig. 1). The region is a part of the Transitional Mediterranean Climatic Zone (Galabov 1982). Forests dominated by oak *Quercus* sp. cover most of the Strandzha Mountains and mainly the ridges of the Derventski Hills and the Sakar Mountains along the border with Turkey. Open non-forest habitats including arable lands and lightly grazed pastures dominate the landscape on the north. Economy in the area was formerly based mainly on farming and extensive livestock husbandry (see also Milchev & Georgiev 2012). Hot and dry summers usually lead to drying up of the smaller rivers. For this reason, a significant number of small reservoirs with earth dams were built for watering and also (less) for irrigated agriculture in the 1970s and 1980s. These functions of reservoirs gradually dropped due to the decline in livestock and agriculture after the democratic changes in the last 25 years. Some of them were periodically used as fish ponds or were drained. But a lot of small reservoirs were abandoned and became wild and overgrown with waterside vegetation.

Birds were detected from the food remains (fresh and decomposed pellets, feathers), collected in and around the nest and day roosting places in 53 Eagle Owl breeding localities in SE Bulgaria in 1994-2013. The samples (n = 1,050) were collected in late April – early May for the first time annually. The localities with breeding attempts were visited again in late

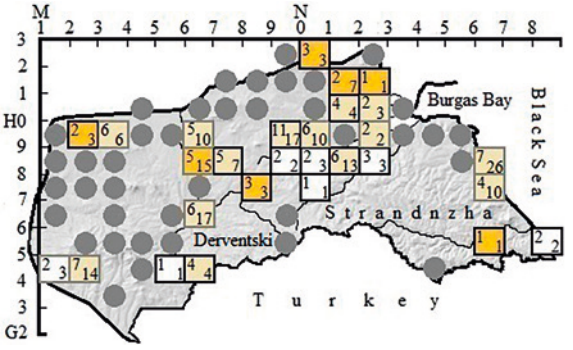

Fig. 1: Breeding distribution of Little Grebe *Tachybaptus ruficollis* in SE Bulgaria. Grey circles: data of Iankov (2007) and Golemanski (2015); grey squares: preys of Eagle Owls support data of Iankov (2007) and Golemanski (2015); black squares: new localities from Eagle Owl diet; numbers in squares: upper left: number of years with preyed specimens, down right: number of preyed specimens; background color of squares indicate the period when specimens were preyed: white: 1994-2005, dark yellow: 2006-2013, light yellow: 1994-2013. – *Brutgebiete des Zwergtauchers in Südost-Bulgarien. Graue Kreise: Vorkommen nach Iankov (2007) und Golemanski (2015); graue Quadrate: Beute des Uhus bestätigt die Angaben von Iankov (2007) und Golemanski (2015); schwarze Quadrate: neue Fundorte in Nahrungsresten des Uhus; Zahlen in den Quadraten: links oben: Anzahl der Jahre mit erbeuteten Exemplaren, rechts unten: Anzahl der erbeuteten Exemplare; Hintergrundfarbe der Quadrate zeigen den Zeitraum, in dem die Beutevögel gejagt wurden: weiß: 1994-2005, dunkelgelb: 2006-2013, hellgelb: 1994-2013.*

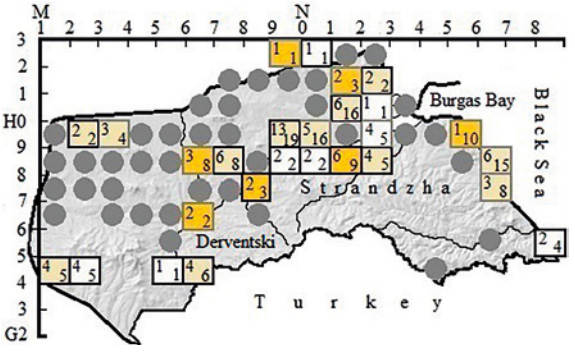

Fig. 2: Breeding distribution of Little Bittern *Ixobrychus minutus* in SE Bulgaria: symbols as in Fig. 1. – *Brutgebiete der Zwergdommel in Südost-Bulgarien: Symbole wie in Abb.1.*

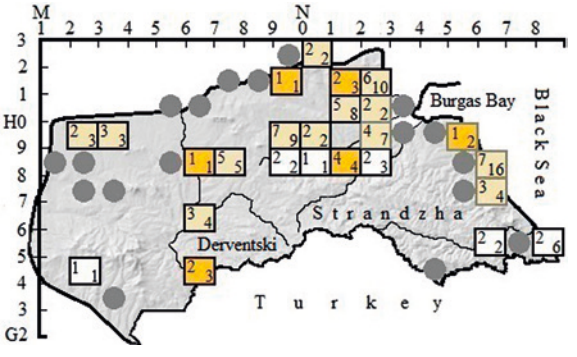

Fig. 3: Breeding distribution of Water Rail *Rallus aquaticus* in SE Bulgaria. Grey circles: data of Iankov (2007); grey squares: prey of Eagle Owls supports data of Iankov (2007); other symbols as in Fig. 1. – *Brutgebiete der Wasserralle in Südost-Bulgarien. Graue Kreise: Vorkommen nach Iankov (2007); graue Quadrate: Beutereste des Uhus bestätigen die Angaben von Iankov (2007); andere Symbole wie in Abb. 1.*

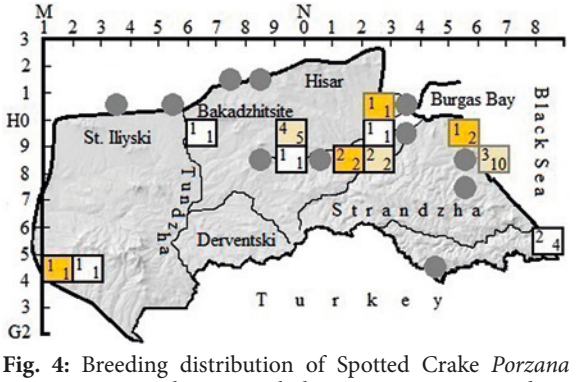

Fig. 4: Breeding distribution of Spotted Crake *Porzana porzana* in SE Bulgaria: symbols as in Fig. 1. – *Brutgebiete des Tüpfelsumpfhuhns Südost-Bulgarien: Symbole wie in Abb.1.*

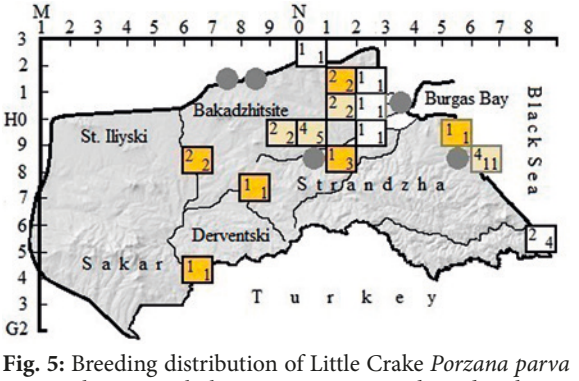

Fig. 5: Breeding distribution of Little Crake *Porzana parva* in SE Bulgaria: symbols as in Fig. 1. – *Brutgebiete des Kleinen Sumpfhuhns in Südost-Bulgarien: Symbole wie in Abb. 1.*

May – early June and then in late August – early September. Later Eagle Owl clutches were studied in late June – mid-July by exception. The bird bones were determined using the comparative collection of the National Museum of Natural History, Sofia, where they were deposited. The feathers have been specified by comparison with the feather collection of J. Menzel since 1997. The minimum number of individuals (MNI) for birds in each sample was estimated mainly based on remains and fragments of limb bones, pelvic and pectoral girdles, crania and mandibles, following the procedures recommended by Frey (1973). Bird feathers identified to species were compared with the list of bone determinations

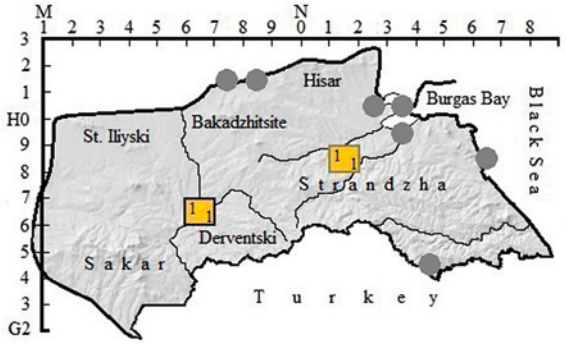

Fig. 6: Breeding distribution of Baillon's Crake *Porzana pusilla* in SE Bulgaria: symbols as in Fig. 1. – *Brutgebiete des Zwergsumpfhuhns in Südost-Bulgarien: Symbole wie in Abb.1.*

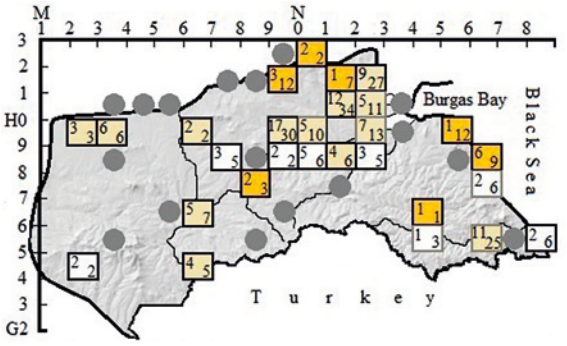

Fig. 7: Breeding distribution of Corncrake *Crex crex* in SE Bulgaria: symbols as in Fig. 1. – *Brutgebiete des Wachtelkönigs in Südost-Bulgarien: Symbole wie in Abb. 1.*

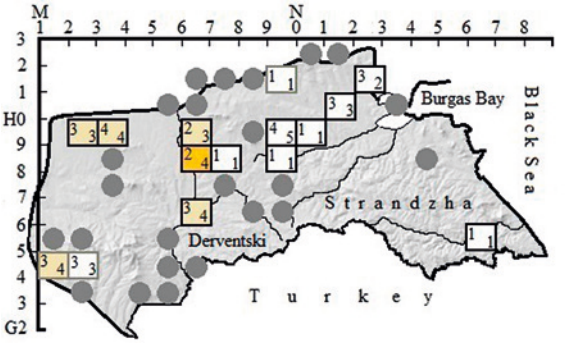

Fig. 8: Breeding distribution of the Eurasian Thick-knee *Burhinus oedicnemus* in SE Bulgaria. Grey circles: data of Iankov (2007), Golemanski (2015), Uhlig & Baumgart (1995) - MG89, Milchev (2009) - MH60; other symbols as in Fig. 1. – *Brutgebiete des Triels in Südost-Bulgarien. Graue Kreise: Vorkommen nach Iankov (2007), Golemanski (2015), Uhlig & Baumgart (1995) - MG89, Milchev (2009) - MH60; andere Symbole wie in Abb. 1.*

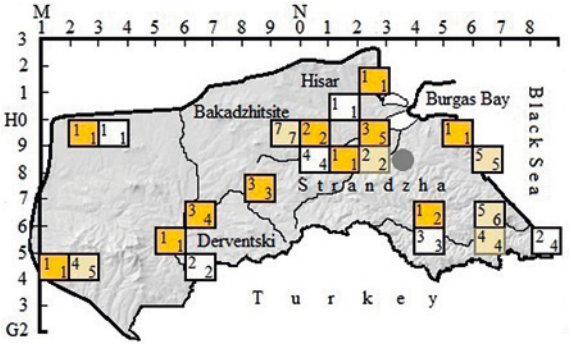

Fig. 9: Distribution of Eurasian Woodcock *Scolopax rusticola* in SE Bulgaria during May - July: symbols as in Fig. 1. – *Vorkommen der Waldschnepfe in Südost-Bulgarien zwischen Mai und Juli; Symbole wie in Abb. 1.*

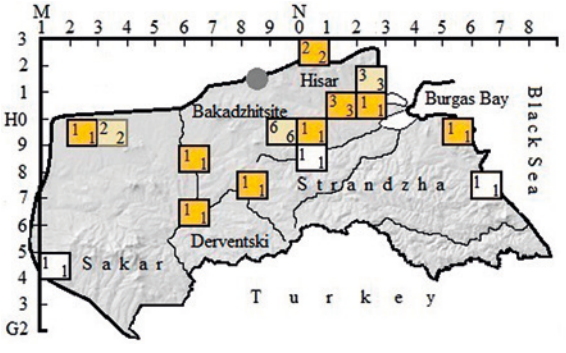

Fig. 10: Breeding distribution of Short-eared Owl *Asio flammeus* in SE Bulgaria. Grey circles: data of Iankov (2007); grey squares: preys of Eagle Owls support data of Iankov (2007); other symbols as in Fig. 1. – *Brutgebiete der Sumpfohreule in Südost-Bulgarien. Graue Kreise: Vorkommen nach Iankov (2007); graue Quadrate: Rupfungen durch den Uhu bestätigen Angaben in Iankov (2007); andere Symbole wie in Abb. 1.*

from the same sample, and the missing species from bone samples were added to the species list.

Mapping of the localities of the studied birds was done on a 10 km Universal Transverse Mercator (UTM) grid. The marked squares cover most of the respective Eagle Owl's hunting area with 2 km range around the nesting place (Leditznig 1996, Dalbeck *et al.* 1998). The number of specimens for the respective species in a square includes MNI in samples collected in late May - July (n = 238 samples), when these bird species do breed. The Western Black Sea flyway passes over the study area, and thereby we try to eliminate possible late migrants in the samples. Equal number of years and specimens in the respective square indicated a possible breeding and more specimens than years marked a probable breeding there according to the criteria used to assess evidence of breeding (Hagemeijer & Blair 1997). The finding of bones or feathers of some juvenile birds was the only proof for a confirmed breeding and was the reason to include such results from samples collected in August – early September (n = 22 samples). The data were shared out in two time periods to be comparable to the national mapping of breeding birds: the first period got into the national mapping between 1990 – 2005 (Iankov 2007, Golemanski 2015) and the second one was between 2006 and 2013.

Table 1: Number of localities and specimens of some rare birds from the Eagle Owl diet in SE Bulgaria in 1994-2013: CR - critically endangered, EN - endangered, VU - vulnerable, NT - near threatened (Golemanski 2015). – *Anzahl der Vorkommen und Stückzahl einiger seltener Vogelarten in den Nahrungsresten des Uhus in Südost-Bulgarien von 1994 bis 2013: CR – vom Aussterben bedroht, EN – stark gefährdet, VU – gefährdet, NT - potentiell gefährdet (Golemanski 2015).*

Species – *Art*	UTM squares (10 km grid) with localities – *UTM-Gitterfelder mit Anzahl Vorkommen*			specimens for mapping – *Anzahl Exemplare für Brutbestandserfassung*	total preyed specimens (% by all bird preys, n = 23,162) – *Summe prädierter Vögel (% der Gesamtbeute, n = 23.162)*
	new	affirmative	total		
Tachybaptus ruficollis VU	17	11	28	191	523 (2.3 %)
Ixobrychus minutus EN	16	11	27	163	388 (1.7 %)
Rallus aquaticus NT	20	5	25	104	279 (1.2 %)
Porzana porzana EN	9	3	12	31	99 (0.4 %)
Porzana parva EN	12	3	15	38	99 (0.4 %)
Porzana pusilla CR	1	1	2	2	9 (0.04 %)
Crex crex VU	22	6	28	260	582 (2.5 %)
Burhinus oedicnemus VU	12	3	15	40	62 (0.3 %)
Scolopax rusticola EN	21	2	23	66	316 (1.4 %)
Asio flammeus	14	1	15	26	90 (0.4 %)

3. Results and Discussion

Eagle Owl diets in 41 (77.4 % of n = 53) localities indicate the presence of ten poorly known and threatened birds species in 190 squares in total on a 10 km UTM grid in SE Bulgaria during their breeding period (Table 1, Fig. 1-10). New localities were found in 144 squares (75.8 %, n = 190) while the other 46 squares (24.2 %) were affirmative localities in comparison to Iankov (2007) and Golemanski (2015). This result confirms the efficiency of Eagle Owl diet for studying birds with a cryptic coloration and nocturnal activity. When it is combined with some special methods for studying the particular species, the results are better (Miltschev *et al*. 2002). A shortage of the method is the lower level of evidences for breeding of the preyed birds, especially, when they are less numerous species with a proportion of less than 2.5 % of the total number of the Eagle Owl prey (Table 1). Only four species in 16 squares (8.4 %, n = 190) were found with a confirmed breeding (Table 2).

The similarity of results for the distribution of Little Grebe and of the harder to find Little Bittern *Ixobrychus minutus* (Table 1) rejects the possibility that the difference in detectability could be the cause of the many missing localities in Iankov (2007). Omitting the small reservoirs in the mapping of SE Bulgaria in Iankov (2007) should have led to these differences with our results. Considerable unconformities with Iankov (2007) have already been identified by Belichev & Milchev (2010), Milchev (2010), Milchev & Georgiev (2014) and Gruychev (2016).

Table 2: Localities with a confirmed breeding of bird species from Eagle Owl diets in SE Bulgaria. – *Gebiete mit bestätigen Brutvorkommen von Vogelarten, die in den Nahrungsresten des Uhus in Südost-Bulgarien gefunden wurden.*

Species	UTM square (number of juvenile birds)
Tachybaptus ruficollis	MG66 (5), MG69 (1), NG07 (1), NG09 (1), NG18 (1), NG67 (2), NG68 (12)
Ixobrychus minutus	MG24 (1), MG99 (1)
Porzana porzana	MG99 (1)
Burhinus oedicnemus	MG24 (1), MG29 (1), MG39 (1), MG66 (2), MG68 (2), MH91 (1)

The Eurasian Woodcock *Scolopax rusticola* bred both in the lowlands and in the mountains of Bulgaria up to 1950s. But the four nest records after the mid-20th century were found only in mountains in the altitudinal range of 900–2,185 m a.s.l. (Iankov 2007, Gruychev & Dyakov 2012). SE Bulgaria with its flat terrain and some hilly parts usually lower than 300-400 m a.s.l. is outside the currently confirmed breeding range. At the same time it is a part of the main wintering area of Eurasian Woodcocks (Glutz von Blotzheim *et al.* 1985). The three observations in Golemanski (2015) and our findings could probably be connected with some late migrants and summering non-breeding birds.

The ten bird species considered in our study are of "least concern" according to the Red List of IUCN (2016), but they have a higher threat status in Bulgaria (Table 1; Golemanski 2015). Only the Short-eared Owl *Asio flammeus* is omitted in the second Bulgarian red data book (Golemanski 2015), although there was no confirmed breeding in the country since 1960 (Iankov 2007).

Our results may have at least two applications of the conservation strategy for birds in Bulgaria. The localities of the most species analysed in our study are related to the preservation of many small reservoirs, whose importance as breeding habitat has not been studied in the area. The positive impact of these ponds

is reported only for the distribution of the Eastern Spadefoot *Pelobates syriacus* (Milchev & Kovachev 2005). Recently abandoned unsupported reservoirs are indicated for causing a number of floods in Bulgaria in recent years. The government prefers an easier and cheaper solution to the problem through their destruction. However, account should be taken of the potential loss of biodiversity by this unilateral decision and to seek opportunities to maintain at least the most significant reservoirs.

Eagle Owl diet with a high number of breeding bird species with high conservation status in Bulgaria and listed in Directive 2009/147/EC indicates suitable areas for inclusion in the Natura 2000 network, and the need of protection according to the national Protected Areas Act. Several squares do not fall within the existing network of protected areas: MG99 with nine species, and MG66, NG09, NH10 each with eight species. These areas coincide completely with important areas for the conservation of some protected small mammals in SE Bulgaria (Milchev & Georgiev 2012), but our efforts in this direction have failed. Only four wetland-inhabiting species were identified in the Eagle Owl diet near the Devil's Swamp (Dyavolsko blato, square NG67) near the town of Primorsko, probably due to the small number of Eagle Owl food samples from there. Drained and turned into a nursery for Summer Snowflake *Leucojum aestivum*, the swamp gradually regenerates itself after ceasing the pumping off of water since 1991. It has become one of the largest wetlands along the Bulgarian Southern Black Sea coast, which is marked by a great diversity of breeding birds (Milchev 1994). The future of this wetland is unclear, because it does not fall into the national network of protected areas and its most eastern part near the town is already partially drained.

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4. Zusammenfassung

Milchev, B. & J. Menzel 2017: Neue Vorkommen wenig bekannter und gefährdeter Brutvogelarten in Bulgarien, nachgewiesen durch Nahrungsreste des Uhus *Bubo bubo*. Vogelwelt. 137: 289 – 294.

Untersuchungen von Nahrungsresten des Uhus in Form von Gewöllen und Federresten in 41 Gebieten in Südost-Bulgarien ergaben 144 (75,8 % von n = 190) bisher unbekannte und 46 (24,2 %) bestätigende Vorkommen von zehn seltenen Brutvogelarten im Zeitraum 1994-2013. Dieses Ergebnis bestätigt die Bedeutung von Nahrungsanalysen des Uhus für die Erfassung der Verbreitung unauffälliger und vorwiegend nachtaktiver Vogelarten. Die allgemeine Verbreitung der am häufigsten hier untersuchten Vogelarten ist auf das Vorhandensein vieler kleiner Stauseen als eine ihrer wichtigsten Brutgebiete in Südost-Bulgarien zurückzuführen. Aufgrund des Vorkommens von acht bis neun seltenen Vogelarten sowie einigen geschützten kleinen Säugetierarten in vier UTM-Quadraten erscheint es wichtig, diese Gebiete in Zukunft auch als mögliche neue Natura 2000-Gebiete in Bulgarien in die Diskussion zu bringen.

5. References

Belichev, P. & B. Milchev 2010: Breeding birds in the Iskar Hunting Ranch (CW Bulgaria). Forest science, Sofia. Vol. XLVII (4): 59-67.

Baumgart, W. & B. Stephan 1972: Eine Zwergtrappe, *Otis tetrax*, als Uhu-Beute in Bulgarien. Beitr. Vogelkd. 18: 357-363.

Dalbeck, L., W. Bergerhausen & O. Krischer 1998: Telemetriestudie zur Orts- und Partnertreue beim Uhu. Vogelwelt 119: 337-344.

Frey, H. 1973: Zur Ökologie niederösterreichischer Uhupopulationen. Egretta 16: 1-68.

Galabov, Z. 1982: Geography of Bulgaria. Vol. I. Physical geography, BAS, Sofia. [in Bulgarian]

Glutz von Blotzheim, U. N. & K. M. Bauer 1994: Handbuch der Vögel Mitteleuropas. Bd. 9 Columbiformes - Piciformes. 2. Aufl. Aula-Verlag, Wiesbaden.

Glutz von Blotzheim, U. N., K. M. Bauer & E. Bezzel 1985: Handbuch der Vögel Mitteleuropas. Bd. 7 Charadriiformes (2. Teil). Schnepfen-, Möwen- und Alkenvögel. Aula-Verlag, Wiesbaden.

Golemanski, V. 2015: Red Data Book of the Republic of Bulgaria. Vol. 2. Animals. IBEI – BAS & MOEW. Sofia.

Gruychev, G. 2016: Declining populations of Chukar Partridge (*Alectoris chukar*) in Bulgaria. Turkish J. Zool. 40: 818-823.

Gruychev, G. & N. Dyakov 2012: First confirmed breeding of Woodcock *Scolopax rusticola* in Vitosha Mountain (CW Bulgaria). Acrocephalus 32: 213–214.

Hagemeijer, E. & M. Blair 1997: The EBCC Atlas of European breeding birds: Their distribution and abundance. T & AD Poyser, London.

Iankov, P. 2007: Atlas of breeding birds in Bulgaria. BSPB, Conservation Series, Book 10. Sofia.

IUCN 2016: The IUCN Red List of Threatened Species. Version 2014.3. www.iucnredlist.org.

Leditznig, C. 1996: Habitatwahl des Uhus (*Bubo bubo*) im Südwesten Niederösterreichs und in den donaunahen Gebieten des Mühlviertels auf Basis radiotelemetrischer Untersuchungen. Abh. Zool.-Bot. Ges. in Österreich 29: 47-68.

Marks, J., R. Cannings & H. Mikkola 1999: Strigidae (Typical Owls). In: del Hoyo, J., A. Elliott, J. Sargatal: Handbook of the Birds of the World. Vol. 5. Barn-owls to Hummingbirds: 76-242. Lynx Edicions, Barcelona.

Mebs, T. & W. Scherzinger 2000: Die Eulen Europas. Kosmos, Stuttgart.

Menzel, J. & B. Milchev 2001: Über eine späte Brut des Triels *Burhinus oedicnemus* in Bulgarien. Ornithol. Mitt. 53: 384-385.

Menzel, J. & B. Milchev 2007: A record of Tengmalm's Owl *Aegolius funereus* in Bulgaria indicating long-distance wandering. Acrocephalus 28: 124-125.

Milchev, B. 1994: Breeding birds atlas of the Strandja mountains, South-east Bulgaria. Sandgrouse 16: 2-27.

Milchev, B. 2009: Breeding biology of the Long-legged Buzzard *Buteo rufinus* in SE Bulgaria, nesting also in quarries. Avocetta 33: 25-32.

Milchev, B. 2010: Expansion of the breeding distribution of Common Redstart *Phoenicurus phoenicurus* in SE Bulgaria. Vogelwelt 131: 257-259.

Milchev, B. & Z. Boev 2014: First Record of the Naumann's Thrush (*Turdus naumanni* Temminck, 1820, *sensu lato*) in Bulgaria. Acta zool. bulg. 66: 559-561.

Milchev, B. & V. Georgiev 2012: Roach's mouse-tailed dormouse *Myomimus roachi* distribution and conservation in Bulgaria. Hystrix 23: 67-71.

Milchev, B. & V. Georgiev 2014: Extinction of the globally endangered Egyptian vulture *Neophron percnopterus* breeding in SE Bulgaria. N. West J. Zool. 10: 266-272.

Miltschev, B., V. Georgiev & A. Kovatschev 2002: Brutbestand und Brutplatzwahl der Schleiereule (*Tyto alba*) in Südost-Bulgarien. Egretta 45: 114-120.

Milchev, B. & A. Kovachev 2005: On the distribution and the typical osteological elements of the Eastern Spadefoot (*Pelobates syriacus balcanicus* K a r., Amphibia, Pelobatidae) in South-east Bulgaria. Ann. Univ. of Sofia "St. K. Ohridski", B.1 - Zoology 95: 57-63.

Miltschev, B. & Y. Sivkov 2006: Der Aal *Anguilla anguilla* – eine neue Art in der Beute des Uhus *Bubo bubo* in Bulgarien. Ornithol. Mitt. 58: 193-194.

Popov, V. & B. Milchev 2001: New Data on the Morphology and Distribution of *Talpa levantis* Thomas, 1906 (Mammalia: Insectivora) in Bulgaria. Acta zool. bulg. 53: 79-94.

Uhlig, R. & W. Baumgart 1995: Verbreitung und Bestand des Triels *Burhinus oedicnemus* in Bulgarien. Vogelwelt 116: 11-17.

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