Terrestrial Ecology and Behaviour
Research Article

ACTA ZOOLOGICA BULGARICA
Acta zool. bulg., 67 (1), 2015: 67-74

Why does the Eagle Owl, *Bubo bubo* (L.), breed rarely in the Kazanlak Valley, Central South Bulgaria?

Boyan P. Milchev, Gradimir V. Gruychev

University of Forestry; Wildlife Management Department, 1765 Sofia, Bulgaria; E-mails: boyan.m@abv.bg; gradi.val@gmail.com

Abstract: Two localities with unsuccessful breeding of Eagle Owls were found in the Kazanlak Valley (0.25 pair/100 sq. km). Mammals (41.3% by number, 47.9% by biomass) and birds (56.2% by number, 52.0% by biomass) predominated in the diet among 72 animal taxa. Most important prey species were *Erinaceus roumanicus* (7.4% by number, 21.3% by biomass) and *Rattus norvegicus* (8.8% by number, 7.4% by biomass), within a broad food niche with a high number of birds. The quantitative parameters of carnivore mammals and birds (11.5% by number, 20.4% by biomass) were much higher than their mean values in Europe and on the Balkan Peninsula. The open non-forested lands were the main hunting habitats but wetlands were the most exploited ones according to their small surfaces in the main hunting area and disproportionate numerous inhabitants in the diets. The small number of breeding birds, later clutches, higher diet diversity with considerable share of mesopredators, in the Eagle Owls studied could be a result of decreasing supply of the preferred prey (following the food stress hypothesis), as well as of inhabiting suboptimal territories in the valley.

Keywords: Eagle Owl, *Bubo bubo*, breeding, diet, protection

Introduction

The Eagle Owl (*Bubo bubo*) inhabits all biotope types in Europe where its conservation status is unfavourable (Mebs, Scherzinger 2000, BirdLife International 2004). IUCN (2013) specifies it as Least Concern, with a decreasing population trend. The breeding area of the species in Bulgaria includes 308 squares on 10-km National Universal Transverse Mercator grid (24.8%, n=1240), from the Bulgarian Black Sea coast up to 1500 m a.s.l., where the Eagle Owl finds suitable rocks for breeding and mostly open areas and wetlands for hunting (Simeonov *et al*. 1991, Iankov 2007). The size of the species population was estimated at 120-150 pairs in the late 1980s (Simeonov *et al*. 1991) and at 420-490 pairs in 2005, which showed a slight increase in the number and distribution (Iankov 2007). Nevertheless, the Eagle Owl is listed as Endangered in the Bulgarian Red Data Book (Golemanski 2011), and its distribution and number is not known well because of its nocturnal activity (Iankov 2007). Donchev (1977) reported on two observations of this owl in the Kazanlak Valley, which were mapped by Simeonov, Michev (1985). Iankov (2007) reported on at least two confirmed and two possible breeding localities in that valley in the period 1990-2005.

The present study aims at presenting the current breeding distribution of the Eagle Owl, as well as the first data about its breeding biology and diet in the Kazanlak Valley.

Material and Methods

Study area

The Kazanlak Valley has a flat, partly hilly relief and is marked out by the steep slopes of the Stara Planina Mountains to the north and the more gentle slopes of the Sredna Gora Mountains to the south, having a total area of around 800 sq. km (Fig. 1). Its western border is the foot of the transverse Krastetz hill (N 42° 35` E 25° 00`, 540 m a.s.l.), while the

eastern border is the Mejdenishki Gorge (N 42° 35` E 26° 05`, 190 m a.s.l.) of the Tundzha River. This river drains the valley and two reservoirs and irrigation systems were built there. The climate is moderate continental, with middle temperatures around 0°C to +1°C in January, and around +22°C in July (Kopralev 2002). The open areas with farmlands predominate in the valley itself, while the extensive pastures and meadows prevail at the foot of the bordering mountains. The mountain slopes are covered by natural deciduous and artificial coniferous forests, but they are preserved in the valley mainly along the river courses. The human settlements, with the exception of a few small towns and the regional center Kazanlak, are mostly villages, without any strongly developed industry at present.

Breeding data collection

The breeding localities of the Eagle Owl were searched for food remains (pellets and prey remains), faeces markings and nests, by walking and climbing rocky slopes, separate rocks and rocky gorges, quarries and steep riverbanks, between 8 and 19 June 2012. Forty-six rocky places were studied, located mainly at the foot of the two bordering mountains. The method with a direct check-up of the potential breeding places has a very good effectiveness in the summer period (Bergerhausen, Willems 1988, Glutz von Blotzheim, Bauer 1994, Simeonov, Milchev 1994). In Bulgaria, the Eagle Owl was found breeding at a place without rocks (an abandoned building) only once (Miltschev 2003). All suitable and accessible buildings in the study area were verified as potential breeding places for the Barn Owl (*Tyto alba*); thus we covered the known diversity of Eagle Owl's nest places. The breeding at the detected localities was studied on the following year in two visits, on 11.05.2013 and 9.06.2013. The check-up of the nests was during the second visit since the small number of food remains and the scarce marking with faeces by the brooding female indicated later broods in May.

The study area falls only partially within 10-km squares on the UTM grid (n=20 squares; Fig. 1). Therefore, the breeding localities of this species in Bulgaria were mapped centrally on a 20-km grid, using the criteria for breeding evidence according to Hagemeijer, Blair (1997).

Diet analysis

The diet was investigated on the ground of food remains (pellets, skin, feathers, etc.) that were collected in the nests and surrounding rocks during the three above-mentioned visits and an additional

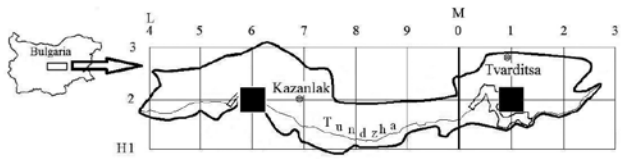

Fig. 1. Eagle Owl (*Bubo bubo*) breeding distribution in the Kazanlak Valley, Central South Bulgaria: full squares – confirmed breeding

check at the beginning of September 2012. The mammals were determined after Popov, Sedefchev (2003), and the authors' comparative collection at the University of Forestry, Sofia. The species difficult for distinguishing, *Apodemus sylvaticus* (L.) and *A. flavicollis* (Melchior), *Microtus arvalis* (Pall.) and *M. levis* Miller, as well as *Mus macedonicus* Petrov, Ruzic and *M. musculus* L., were identified to the genus level, which includes only the respective pair of species. The other taxa were determined according to the comparative collections at the National Museum of Natural History (NMNH), Sofia. The estimates of the minimum number of individuals in each sample followed the procedures recommended by Frey (1973), and were based on: – remains and fragments of limb bones, pelvic and pectoral girdles, crania and mandibles in birds; – mainly remains and fragments of crania, mandibles and pelvic in mammals, reptiles, and amphibians; – head fragments, prothoraces, wing-cases and legs in invertebrates. The bird feathers identified to the species level were compared with the list of bone determinations from the same sample, and any species missing in the bone samples were added to the species list. The biomass was calculated after Glutz von Blotzheim, Bauer (1994) and Popov, Sedefchev (2003). The collected egg shells and the bones of the Eagle Owls and their preys were deposited to the NMNH.

The percentage of major habitat types, such as: open non-forest lands, forest, wetlands, rocks and urban lands (settlements, separate buildings and main road networks), within the radius of 2 km around the nest, which corresponds to the most usable part of the Eagle Owl's hunting territory (Leditznig 1996, Dalbeck *et al*. 1998), were calculated through the 1:25000 scale maps of the local area. The prey species were distributed according to their preferable habitat in the same types. The inhabitants of the different types of habitats, such as the Red fox *Vulpes vulpes* and the Common mole *Talpa europaea,* were classified as "habitat generalists".

The food-niche breadth was estimated by Shannon index:

$$H = -\sum_{i=1}^{N} p_i \ln p_i$$

where p_i is the proportion of prey taxon i in the diet. Statistical differences between the diets were calculated by chi-square tests.

Results

Breeding biology

The breeding Eagle Owls occupied two localities (4.3%, n=46 investigated suitable rocky habitats; Fig. 1). The western one (WL) was an old locality without breeding in 2012. The remains of an adult eaten by a carnivore mammal and a skeleton of a flying young from the previous year were found. The nest was on a terrace with 1 m in diameter in the middle of a rocky massif with a height of around 50 m. The terrace had a western exposure; there were a prominent shelter and a bush of Dog rose (*Rosa* sp.) on it. The same nest was used for unsuccessful breeding in 2013, where the hatch of two owlets (judging by the shell pieces of two eggs) were lost in the earliest stages for unknown reasons.

The eastern locality (EL) was newly occupied by a pair without a breeding attempt in 2012. The pair used an old nest of the Long-legged Buzzards, *Buteo rufinus* (Cretzschmar), in the base of a black pine (*Pinus nigra*) in 2013 (Fig. 2). This tree grew at the edge of a terrace with a north-eastern exposure and dimensions of 6 m in length and 0.7 m as a maximum width, located in the middle of a rock with a height of 15 m. A carnivorous mammal had destroyed the clutch of two eggs, the pieces of which were taken on the terrace up to 2 m from the nest.

Diet composition

The diet composition was determined based on the remains of 443 individuals distributed among 72 identified animal taxa, with prevalence of birds (49 taxa, 68.1%; Table 1). Mammals and birds predominated by number and biomass in the diets, with different proportions at the localities. The most important preys, according to the number, were three species at WL (cumulative 22.6%) and four species at EL (45.1%), with only voles (*Microtus* sp.) being found at both localities. Four species had the most considerable share in the biomass at WL (cumulative 45.9%) and six species at EL (64.3%), with only remains of the Northern White-breasted hedgehog (*Erinaceus roumanicus*) being found on both places. The more diverse diet with broader food niche (total 3.75, WL 3.78, EL 3.15) at WL corresponds to preying more often on birds and more rarely, on mammals there. The differences in the frequency of preys in the diets between the consecutive years at the

Fig. 2. The Eagle Owl (*Bubo bubo*) clutch destroyed by a carnivorous mammal in an old Long-legged Buzzard (*Buteo rufinus*) nest with a diameter of 0.75 m, the Kazanlak Valley, Central South Bulgaria, 9.06.2013; Photo: B. Milchev

Table 1. Diet of the Eagle Owl (*Bubo bubo*) in the Kazanlak Valley; in parenthesis: the respective values in the western and eastern localities; tr. – traces (<0.1%); * – most important prey with >5% in respective diets; [1] animals with less than 1% by total number or biomass – number of specimens (respective values in the western and eastern localities): [1] *Talpa europaea* L. – 3 (2; 1), *Crocidura leucodon* (Hermann) – 2 (1; 0), *Spermophilus citellus* (L.) -1 (1; 0), *Dryomys nitedula* (Pall.) – 1 (1; 0), *Mus musculus/macedonicus* – 4 (3; 1), *Rattus rattus* (L.) – 1 (1; 0), *Nannospalax leucodon* (Nordann) – 1 (1; 0), *Mustela nivalis* L. – 2 (2; 0), *Mustela putorius* L. – 1 (0; 1), *Anas crecca* L. – 2 (0; 2), *Anas querquedula* L. – 1 (1; 0), *Coturnix coturnix* (L.) – 4 (4; 0), *Circus pygargus* (L.) – 1 (1; 0), *Buteo buteo/Accipiter gentilis* juv. – 1 (1; 0), *Falco tinnunculus* L. – 3 (2; 1), *Vanellus vanellus* (L.) – 2 (1; 1), *Gallinago gallinago* (L.) – 2 (2; 0), *Streptopelia decaocto* (Frivaldszky) – 1 (1; 0), *Streptopelia turtur* (L.) -2 (2; 0), *Cuculus canorus* L. – 2 (2; 0), *Asio flammeus* (Pontoppidan) – 1 (1; 0), *Coracias garrulus* L. – 1 (1; 0), *Dendrocopos major* (L.) – 1 (1; 0), *Dendrocopos major/syriacus* – 2 (2; 0), *Alauda arvensis* L. – 2 (1; 1), *Lullula arborea* (L.) – 2 (1; 1), *Turdus pilaris* L. – 4 (3; 1), *Turdus iliacus* L. – 2 (1; 1), *Turdus viscivorus* L. – 4 (4; 0), *Turdus* sp. – 4 (2; 2), *Sylvia communis* Latham – 1 (0; 1), *Lanius collurio* L. – 4 (3; 1), *Garrulus glandarius* (L.) – 4 (4; 0), *Passer domesticus* (L.) – 1 (0; 1), *Miliaria calandra* L. – 1 (1; 0), Aves nondet. – 2 (2; 0), *Lacerta viridis* (Laurenti) – 1 (1; 0), *Pelophylax ridibundus* (Pall.) – 4 (2; 2), *Lucanus* sp. – 3 (1; 2), Cerambycidae – 1 (1; 0), *Potamon ibericum* (Bieberstein) – 2 (0; 2)

Prey	**Number ind.**	**% by Number**	**% by Biomass**
Erinaceus roumanicus Barrett-Hamilton	33 (24; 9)	7.4* (9.6*; 4.9)	21.3* (26.9*; 13.7*)
Lepus europaeus Pall.	14 (4; 10)	3.2 (1.5; 5.4*)	8* (4; 13.4*)
Glis glis (L.)	7 (6; 1)	1.6 (2.3; 0.5)	0.8 (1.1; 0.3)
Apodemus flavicollis/sylvaticus	12 (8; 4)	2.7 (3.1; 2.2)	0.3 (0.4; 0.2)
Rattus norvegicus (Berkenhout)	39 (0; 39)	8.8* (0; 21.2*)	7.4* (0; 17.4*)
Microtus arvalis/levis	37 (22; 15)	8.4* (8.5*; 8.2*)	1.1 (1.1; 1)
Arvicola amphibius (L.)	22 (3; 19)	5* (1.2; 10.3*)	1.9 (0.4; 3.9)
Vulpes vulpes (L.)	2 (2; 0)	0.5 (0.8; 0)	4.3 (7.5*; 0)
Felis catus L.	1 (1; 0)	0.2 (0.4; 0)	1.3 (2.2; 0)
Mammalia subtotal	183 (83; 100)	41.3 (32; 54.3)	47.9 (45.4; 51.4)
Anas platyrhynchos L.	6 (2; 4)	1.4 (0.8; 2.2)	3.3 (0.3; 7.3*)
Anas crecca/querquedula	6 (4; 2)	1.4 (1.5; 1.1)	1.9 (2.2; 1.5)
Perdix perdix (L.)	12 (3; 9)	2.7 (1.2; 4.9)	3.9 (1.7; 6.8*)
Tachybaptus ruficollis (Pall.)	6 (2; 4)	1.4 (0.8; 2.2)	1 (0.6; 1.6)
Ixobrychus minutus (L.)	5 (4; 1)	1.1 (1.5; 0.5)	0.6 (0.9; 0.3)
Accipiter gentilis (L.)	1 (0; 1)	0.2 (0; 0.5)	1 (0; 2.3)
Buteo buteo (L.)	5 (1; 4)	1.1 (0.4; 2.2)	3.1 (1.2; 5.7*)
Rallus aquaticus L.	5 (4; 1)	1.1 (1.5; 0.5)	0.5 (0.7; 0.2)
Crex crex (L.)	7 (7; 0)	1.6 (2.7; 0)	1 (1.7; 0)
Gallinula chloropus (L.)	18 (13; 5)	4.1 (5*; 2.7)	4.3 (5.4*; 2.8)
Fulica atra L.	5 (2; 3)	1.1 (0.8; 1.6)	3.4 (2.3; 4.7)
Scolopax rusticola L.	4 (4; 0)	0.9 (1.5; 0)	1 (1.7; 0)
Columba livia f. dom. Gmelin	7 (5; 2)	1.6 (1.9; 1.1)	2 (2.5; 1.3)
Columba palumbus L.	4 (4; 0)	0.9 (1.5; 0)	1.6 (2.8; 0)
Tyto alba (Scopoli)	9 (6; 3)	2 (2.3; 1.6)	2.3 (2.7; 1.8)
Athene noctua (Scopoli)	5 (4; 1)	1.1 (1.5; 0.5)	0.9 (1.2; 0.4)
Strix aluco L.	5 (4; 1)	1.1 (1.5; 0.5)	1.8 (2.5; 0.9)
Asio otus (L.)	14 (10; 4)	3.2 (3.9; 2.2)	3.3 (4; 2.2)
Turdus merula L.	14 (11; 3)	3.2 (4.2; 1.6)	1.1 (1.4; 0.5)
Turdus philomelos Brehm	14 (12; 2)	3.2 (4.6; 1.1)	0.8 (1.2; 0.3)
Pica pica (L.)	5 (4; 1)	1.1 (1.5; 0.5)	0.9 (1.3; 0.4)
Corvus cornix L.	11 (8; 3)	2.5 (3.1; 1.6)	4.8 (6.1*; 3.1)
Sturnus vulgaris L.	11 (6; 5)	2.5 (2.3; 2.7)	0.7 (0.7; 0.8)
Passeriformes nondet.	13 (7; 6)	2.9 (2.7; 3.3)	0.3 (0.3; 0.3)
Aves subtotal	249 (171; 78)	56.2 (66; 42.4)	52 (54.5; 48.5)
Reptilia subtotal	1 (1; 0)	0.2 (0.4; 0)	tr.
Amphibia subtotal	4 (2; 2)	0.9 (1.2; 1.1)	0.1 (0.1; 0.1)
Invertebrates subtotal	6 (2; 4)	1.4 (0.8; 2.2)	tr.
Total	443 (259; 184)	100	(66822.2 g; 49327.4 g)

Table 2. Predatory mammals and birds (% by number; % by biomass) in the Eagle Owl (*Bubo bubo*) diets in Bulgaria and in Europe (average percentages ±SD; Lourenço *et al*. 2011). Data: 1 – Baumgart *et al*. (1973), 2 – Baumgart (1975); 3 – Simeonov, Boev (1988); 4 – Obuch, Benda (1995), 5 – Simeonov *et al*. (1998)

Prey \ Data	1	2	3	4	5	This study	Europe
Carnivores	0.7; 0.2	0.3; 0.2	1.3; 4.4	0.3; 2.5	0.1; 0.02	1.4; 6.4	0.8 ± 1.2; 1.6 ± 2.0
Raptors	2.4; 2.7	1.4; 2.0	1.1; 1.1	0.6; 1.0	0.8; 1.6	2.5; 5.4	1.2 ± 1.6; 2.0 ± 2.4
Owls	2.7; 1.7	1.9; 1.7	1.5; 1.3	1.3; 2.5	1.6; 1.9	7.7; 8.6	2.4 ± 2.7; 2.3 ± 2.5
Total	5.9; 4.6	3.6; 3.9	3.9; 6.8	2.2; 6.0	2.4; 3.5	11.5; 20.4	4.4 ± 3.9; 6.0 ± 4.7

Table 3. The basic habitats (%) within a radius of 2 km around the Eagle Owl (*Bubo bubo*) nests, and the respective prey groups (% by number and % by biomass) in its diet in the Kazanlak Valley: WL – western locality; EL – eastern locality; * p<0.01

Localities		Open areas	Forests	Urban lands	Wetlands	Rocks	Habitat generalist
WL	Habitat area	45.3	41.6	8.9	0.7	3.5	-
	Prey (N%)	30.9	29.7*	9.3*	15.1	0.8	10.8
	Prey (B%)	19.8	20.6	9.9*	13.8	0.6	34.6*
EL	Habitat area	53.7	16.7	26.2	3.2	0.1	-
	Prey (N%)	26.1	12.0*	27.7*	24.5	0.5	6.0
	Prey (B%)	25.7	12.8	21.8*	23.8	0.4	15.3*

same collection site were insignificant, but the diets at two localities differed significantly in 2013 (χ^2_{58} = 79.72, p<0.05). The European water voles (*Arvicola amphibius*) and Norway rats (*Rattus norvegicus*) were caught significantly more often at EL.

The quantitative parameters of carnivorous mammals and birds in the Eagle Owl diet in the study area were much higher than their mean values in Europe (Table 2). Their share in the number of preys was two to five times greater in the Kazanlak Valley in comparison to that found for Bulgaria, according to available data. Their contribution to the biomass of the food exceeded three to six times the previous results in the country. Mesopredators, such as: young Red foxes (*Vulpes vulpes*), Common Buzzards (*Buteo buteo*), Long-eared Owls (*Asio otus*), and Barn Owls had the highest importance in the Eagle Owl diets (Table 1).

The inhabitants of open areas were the most numerous preys at both localities, and together with forest inhabitants formed the main part of the prey number at WL, while with inhabitants of urban lands and wetlands – the main part of the prey number at EL (WL 60.6%, EL 78.3% by number; Table 3). At WL, the inhabitants of the same habitat types contributed to the main part of biomass, together with the grown share of habitat generalists (WL 70.5%, EL 71.3% by biomass). The highly significant differences were between the shares of the inhabitants of different habitat types in the diets at the two localities, according to the number (χ^2_5 = 20.86, p<0.01) and the biomass (χ^2_5 = 17.29, p<0.01). At WL, the significantly more important preys were the inhabitants of forests in terms of the number and the group of generalists with regard to the biomass. At EL, the more important preys, both in terms of the number and biomass, were the inhabitants of urban lands.

Discussion

Breeding biology

The Kazanlak Valley combines a high number of suitable rocky habitats (n=46) for breeding, next to open areas, wetlands and small urban areas preferred by the Eagle Owls for hunting. Nevertheless, this owl breeds very rarely there, according to the previous investigations (Donchev 1977, Simeonov, Michev 1985, Iankov 2007). The present study does not confirm the existence of all reported breeding localities. The mapping of localities for a period of 16 years by Iankov (2007) does not give any possibility to determine when the last four breeding localities disappeared. The two newly found localities confirm the information about scarcity of the Eagle Owl and the lack of an increase in its number and distribution in the studied valley.

The characteristics of the nest places fall within those described by Simeonov, Milchev (1994) and Miltschev (2003). In the neighbouring areas of Southeast Bulgaria, the laying period is between the last decade of February and the end of March (Simeonov, Milchev 1994, Milchev unpubl. data). The clutches in the Kazanlak Valley from May 2013 should be later ones that connect usually with the

habitation of suboptimal territories for owls and raptors (Newton 1979, Glutz von Blotzheim, Bauer 1994). The Eagle Owls bred unsuccessfully for the two consecutive years. The only reason known for this is the mentioned destroying of the clutch by a carnivorous mammal. Similar cases were reported in Southeastern Bulgaria (Simeonov, Milchev 1994), and in other parts of Europe (Frey 1973, Solé 2000, Suchi 1978, Kunstmuller 1996, Gritschik, Tishechkin 2002).

The constant small number of the breeding pairs in the studied valley could be a result of the combined influences of different factors. The direct and indirect influences by people have important negative consequences for the Bulgarian population (Simeonov *et al*. 1991, Simeonov, Milchev 1994). However, in this study, there was no any evidence of breeding failures or death of birds that were caused by people. The possible negative impact of the Golden Eagle, *Aquila chrysaetos* (L.) (Baumgart 1975, Mikkola 1983), as a larger raptor and rock-nester may be considered negligible. There were not any known old localities of the Golden Eagle for the last two decades (Iankov 2007), and we found only two in the studied area. The carnivorous mammals, such as: the Golden jackal *Canis aureus* L., Red fox, and the Stone Marten *Martes foina* (Erxleben), can decrease the breeding success in the Eagle Owl, but the adults of this owl are not preys for the mentioned species (Mikkola 1983, Glutz von Blotzheim, Bauer 1994).

Diet composition

The Eagle Owl is an opportunistic raptor, with the mass of the preferred preys being between 200 and 1900 g; this species also prefers mammals to hunting other vertebrates (Glutz von Blotzheim, Bauer 1994, Mebs, Scherzinger 2000). In this context, the food availability and accessibility of the potential preys in the hunting territory set the pattern for local differences in the diets (Mebs, Scherzinger 2000, Penteriani *et al*. 2002, 2005), as found in this study as well. The importance of the Northern White-breasted Hedgehogs and voles (*Microtus*, *Arvicola*) in the diets from Bulgaria (Baumgart *et al*. 1973, Obuch, Benda 1996, Simeonov *et al*. 1998, Simeonov, Boev1988, Miltschev 2008), neighbouring Greece (Papageorgiou *et al*.1993) and Romania (Sandor, Ionescu 2009) was confirmed by the present study. However, the food niches were broad, with a high number of bird species. For the first time, such a large share of the carnivorous mammals and birds in the Eagle Owl diets on the Balkan Peninsula was found (Lourenço *et al*. 2011). Recently, intense preying on raptors was reported for a nest in Southeast Bulgaria (Miltschev, Menzel 2012). The observed rich diversity of the diet, with considerably large share of mesopredators, could be a result of the decreasing supplies of the preferred prey (according to the food stress hypothesis, Serrano 2000, Lourenço *et al*. 2011). This is associated with the lower breeding success of the top predator as the Eagle Owl (Lourenço *et al*. 2011), and may be one of the most likely explanations for the small breeding success of the species in the Kazanlak Valley.

The open non-forest lands covered the greatest area in the most exploited hunting range of the Eagle Owls in the Kazanlak Valley. They provided the main part of the food in the Eagle Owl, being its preferred hunting habitats (Simeonov *et al*. 1998, Mebs, Scherzinger 2000, Penteriani *et al*. 2002). The inhabitants of the urban lands (rats *Rattus* and feral pigeons) were important preys for many populations, usually in highly urbanised environments (Grüll, Frey 1992, Dahlbeck 1996, Simeonov *et al*. 1998, Marchesi *et al*. 2002, Augst 2003, Sandor, Ionescu 2009), as in the case with EL in this study. The forests occupied almost the half of the main hunting territory in WL and provided a high number of birds, mainly passerines. However, the wetlands were the most exploited habitats according to their small surfaces and disproportionate numerous inhabitants in the diets. The Eagle Owls took advantage of the high biodiversity in the wetlands, like another opportunist among owls, the Barn Owl, which profited by hunting on their inhabitants in South Bulgaria (Miltschev *et al*. 2004, Milchev *et al*. 2006).

The endangered Eagle Owl in the Kazanlak Valley can not be preserved, according to the national Protected Areas Act or by the formal protection of the species in Bulgaria. The access to the protected areas is not restricted, and the Eagle Owl nests have been destroyed by people many times, even in some strict reserves as Ropotamo (Miltschev, Sivkov 2006, Milchev unpubl. data). Since 2007, when Bulgaria joined the European Union, the Natura 2000 sites have been designated. The Eagle Owl population breeding at these sites in Southeast Bulgaria has not been positively affected by this (Milchev unpubl. data) because the rocks with nests remain accessible for everyone, while the food supply for the species in those regions has not been improved.

Acknowledgements: We express our deep gratitude to D. Emin for his assistance in the field. We thank J. Menzel for the identification of the bird feathers to species and N. Tzankov for identification of the lizards. The investigations in 2012 were carried out under Grant 135/2012 of the Fund for Scientific Research, University of Forestry.

References

Augst U. 2003. Reproduction und Bestandsentwicklung des Uhus *Bubo bubo* im Elbsandsteingebirge. – *Vogelwelt*, **124**: 229-239.

Baumgart W. 1975. An Horsten des Uhus (*Bubo bubo*) in Bulgarien.II.Der Uhu in Nordostbulgarien. – *Zoologische Abhandlungen* (Dresden), **33**: 251-275.

Baumgart W., S. Simeonov, M. Zimmermann, H. Bünsche, P. Baumgart and G. Kühnast 1973. An Horsten des Uhus (*Bubo bubo*) in Bulgarien. I. Der Uhu im Iskerdurchbruch (Westbalkan). – *Zoologische Abhandlungen Staatliches Museum für Tierkunde Dresden*, **32**: 203-247.

Bergerhausen W., H. Willems. 1988. Methodik und Effizenz der Bestandskontrolle einer Population des Uhus (*Bubo bubo* L.). – *Charadrius*, **3**: 171-187.

BirdLife International 2004. Birds in Europe: population estimates, trends and conservation status. Cambridge, UK: BirdLife International. (BirdLife Conservation Series No. 12). 374 p.

Dahlbeck L. 1996. Die Bedeutung von Hausratte (*Rattus rattus*) und Wanderratte (*Rattus norvegicus*) für die Ernährung des Uhus (*Bubo bubo*) in Eifel und Saarland. – *Säugetierkundliche Information*, **4**: 155-162.

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

Donchev S. 1977. Birds in the Valley of Roses. – *Acta zoologica bulgarica*, **6**: 15-34. (In Bulgarian).

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

Glutz von Blotzheim U., K. Bauer 1994. Handbuch der Vögel Mitteleuropas. Bd. 9. Akademische Verlagsgesellschaft, Wiesbaden. 1148 p.

Golemanski V. (Ed.). 2011. Red Data Book of the Republic of Bulgaria. Volume 2. Animals. IBEI – BAS & MOEW, Sofia. 372 p. (In print).

Gritschik W., Tishechkin A. 2002. Eagle Owl (*Bubo bubo*) in Belarus: distribution and breeding biology. – *Subbuteo*, **5**:3-19. (In Russian).

Grüll A., H. Frey 1992. Bestandsentwicklung, Bruterfolg und Nahrungszusammensetzung des Uhus (*Bubo bubo*) im Bergenland von1981 bis 1991. – *Egretta*, **35**: 20-36.

Hagemeijer E., M. Blair (ed.) 1997. The EBCC Atlas of European breeding birds: Their distribution and abundance. T & AD Poyser, London, 903 p.

Iankov P. (ed.) 2007. Atlas of breeding birds in Bulgaria. BSPB, Conservation Series, Book 10. Sofia, 679 p.

IUCN 2013. IUCN Red List of Threatened Species. Version 2013.1. <www.iucnredlist.org>. Downloaded on 10 October 2013.

Kopralev I. (Ed.) 2002. Geography of Bulgaria. Bulgarian Academy of Science, Sofia, 760 p. (In Bulgarian).

Kunstmuller I. 1996. Abundance and breeding biology of the Eagle Owl (*Bubo bubo*) in the Czech-Moravian Highlands in the years 1989-1995. – *Buteo*, **8**: 81-102.

Leditznig C. 1996. Habitatwahl des Uhus (*Bubo bubo*) im Südwesten Niederösterreichs und in den donaunahen Gebieten des Mühlviertels auf Basis radiotelemetrischer Untersuchungen. – *Abhandlungen der Zoologisch-Botanischen Gesellschaft in Österreich*, **29**: 47-68.

Lourenço R., S. Santos, J. Rabaça and V.Penteriani 2011. Superpredation patterns in four large European raptors. – *Population Ecology*, **53**: 175-185.

Marchesi L., F. Sergio and P. Perdini. 2002. Costs and benefits of breeding in human-altered landscapes for the Eagle Owl *Bubo bubo*. – *Ibis*, **144**: 164-167.

Mebs T., W. Scherzinger 2000. Die Eulen Europas. Franckh-Kosmos Verlag, Stuttgart, 396 p.

Mikkola R. 1983. Owls of Europe. T.& A.D.Poyser. Calton, 397 p.

Milchev B., Z. Boev and N. Kodjabashev 2006. Breeding distribution and diet composition of the Barn Owl (*Tyto alba* (Scopoli, 1769)) (Aves: Strigiformes) in the North-Western Upper Thracian Plane (Bulgaria). – *Acta zoologica bulgarica*, **58**: 83-92.

Miltschev B. 2003. Zwei ungewönliche Standorte bei der Brutplatzwahl des Uhus *Bubo bubo* in Bulgarien. – *Ornithologische Mitteilungen*, **55**: 103-105.

Miltschev B. 2008. Nicht durch Nahrungsmangel hervorgerufener Kannibalismus beim Uhu *Bubo bubo*. – *Ornithologische Mitteilungen*, **60**: 202-206.

Miltschev B., J. Menzel 2012. Rupfung eines weiblichen Schreiadlers *Aquila pomarina* durch einen Uhu *Bubo bubo*. – *Ornithologische Mitteilungen*, **64**: 21-23.

Miltschev, B., Z. Boev and V. Georgiev 2004. Die Nahrung der Schleiereule (*Tyto alba*) in Südost-Bulgarien. – *Egretta*, **47**: 66-77.

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

Newton I. 1979. Population ecology of Raptors. Poyser, Berkhamsted, 399 p.

Obuch J., P. Benda 1996. Contribution to the feeding ecology of *Strix aluco* and *Bubo bubo* (Aves: Strigiformes) in Southwestern Bulgaria. – *Acta Societatis Zoologicae Bohemicae*, **60**: 43-49.

Papageorgiou N., C. Vlachos and D. Bakaloudis 1993. Diet and nest site characteristics of Eagle Owl (*Bubo bubo*) breeding in two different habitats in north-eastern Greece. – *Avocetta*, **17**: 49-54.

Penteriani V., M. Gallardo and P. Roche 2002. Landscape structure and food supply affect Eagle owl (*Bubo bubo*) density and breeding performance: a case of intra-population heterogeneity. – *Journal Zoology*, **257**: 365-372. DOI:10.1017/S0952836902000961.

Penteriani V., F. Sergio, M. Delgado, M. Gallardo and M. Ferrer 2005. Biases in population diet studies due to sampling in heterogeneous environments: a case study with the Eagle Owl. – *Journal of Field Ornithology*, **76**: 237-244.

Popov V., A. Sedefchev 2003. Mammals in Bulgaria. Geosoft, Sofia, 291 p. (In Bulgarian).

Sandor A., D. Ionescu 2009. Diet of the Eagle owl (*Bubo bubo*) in Braşov, Romania. – *North-Western Journal of Zoology*, **5**:170-178.

Serrano D. 2000. Relationship between raptors and rabbits in the diet of Eagle Owls in southwestern Europe: competition removal or food stress? – *Journal of Raptor Research*, **34**: 305-310.

Simeonov S., B. Milchev 1994. Study of the Eagle Owl (*Bubo bubo* (L.)) in the Strandzha mountain (Southeast Bulgaria). I. Distribution, habitats and breeding biology. – *Ecology*, **26**: 78-87 (In Bulgarian).

Simeonov S., B. Milchev and Z. Boev.1998. Study of the Eagle Owl (*Bubo bubo* (L.)) (Aves:Srigiformes) in the Strandzha mountain (Southeast Bulgaria).II. Food spectrum and trophic specialization. – *Acta zooogica bulgarica*, **50**: 87-100.

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

Simeonov S., T. Michev and D. Nankinov, (1990). Fauna Bulgarica. Vol. 20. Aves. Part.I. BAS, Sofia, 350 p. (In Bulgarian).

Simeonov S., Z. Boev 1988. A study of the nutritive spectrum of the Eagle Owl (*Bubo bubo* L.) in Bulgaria. – *Ecology*, **21**: 47-56. (In Bulgarian).

Solé J. 2000, Depredaciones de zorro *Vulpes vulpes* sobre Búho Real *Bubo bubo* en un área del litoral Iberico. – *Ardeola*, **47**: 97-99.

Suchi O. 1978. Das Nisten des Uhus (*Bubo bubo*) in Jeseniky. – *Zpravy Moravskeho Ornithologickeho Sdruzeni*, **20**: 7-32.

Received: 11.01.2014
Accepted: 17.05.2014