Distribution, abundance, breeding parameters, threats and prey preferences of the eastern imperial eagle (*Aquila heliaca*) in European Turkey

Rozšírenie, početnosť, hniezdne parametre, hrozby a potravné preferencie orla kráľovského (*Aquila heliaca*) v európskej časti Turecka

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Abstract: During the period 2008–2013, 32 different breeding territories were occupied by eastern imperial eagles (EIEs). These territories were mainly distributed in two regions: the Dervent Heights / Yıldız Mts. and the area to the north of the Marmara sea coast. The nearest neighbour distance established was 4.2 km. The mean distance between pairs was 10.44 ± 2.95 km. The mean value of breeding success for the period 2008–2013, including 107 cases of incubation, was 1.01 ± 0.10 . The mean breeding success of birds in the Marmara region (1.05 ± 0.78) was higher than that in the Dervent Heights / Yıldız Mts. (0.91 ± 0.84). The present study on the diet of the EIE was based on the remains of 582 prey items of at least 70 taxa. Mammals were the most common group (46.5%), followed by birds (32.4%) and reptiles (20.3%). The white-breasted hedgehog (*Erinaceus roumanicus*) was the most common prey, followed by two tortoises – Hermann's tortoise (*Eurotestudo hermanni*) and the Greek tortoise (*Testudo graeca*) – which together accounted for a total of 14.4% of the prey caught. The prey species particularly represented in the food spectrum of the studied pairs were: the yellow-legged gull (*Larus michahellis*), the European souslik (*Spermophilus citellus*), the chicken (*Gallus gallus* f. *domestica*) and the white stork (*Ciconia ciconia*). These species together accounted for 67.8% of the prey caught. There was a statistically significant difference ($Z=2.52$, $p=0.01$) in the food preferences of the EIEs in the two studied regions.

Abstrakt: V období 2008–2013 bolo orlami kráľovskými obsadených 32 rôznych hniezdných teritórií. Tieto územia sa nachádzajú najmä v dvoch oblastiach: pohorie Derventa / Yıldız a územie na sever od Marmarského mora. Najbližšia vzdialenosť medzi hniezdiskami bola 4,2 km. Stredná vzdialenosť medzi pármí bola $10,44 \pm 2,95$ km. Priemerná hodnota hniezdnej úspešnosti v období 2008–2013 vrátane 107 prípadov inkubácie bola $1,01 \pm 0,10$. Priemerná hniezdna úspešnosť vtákov v Marmarskom regióne ($1,05 \pm 0,78$) bola vyššia ako v oblasti pohorí Derventa / Yıldız ($0,91 \pm 0,84$). Predkladaná štúdia potravy orla kráľovského bola založená na 582 zvyškoch koristi, obsahujúcej minimálne 70 taxónov. Cicavce boli najrozšírenejšie skupinou (46,5 %), nasledované vtákmi (32,4 %) a plazmi (20,3 %). Najčastejšou korisťou bol jež bledý (*Erinaceus roumanicus*) a dva druhy korytnačiek – korytnačka zelenkastá (*Eurotestudo hermanni*) a korytnačka grécka (*Testudo graeca*), ktoré dohromady predstavovali celkom 14,4 % z ulovenej koristi. Potravné spektrum sledovaných párov obsahovalo tieto druhy koristi: čajka žltónohá (*Larus michahellis*), syseľ pasienkový (*Spermophilus citellus*), domáca sliepka (*Gallus gallus* f. *domestica*) a bocian biely (*Ciconia ciconia*). Tieto druhy dohromady tvorili 67,8 % z ulovenej koristi. Bol preukázaný štatisticky významný rozdiel ($Z=2,52$, $p=0,01$) v preferencii potravy orlov kráľovských v oboch študovaných oblastiach.

Key words: population dynamics, diet, conservation measures

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Introduction

The eastern imperial eagle (*Aquila heliaca*) (EIE) is distributed in various regions of Turkey (Kirwan et al. 2008). Due to the lack of systematic surveys in the European part of the country, the species was considered to be breeding in isolated localities and to be on the brink of extinction (Warncke 1966, 1968, Wirth 1996, Gursan & Bilgin 2002, Kirwan et al. 2008). However, the study carried out in 2008 and 2009 revealed a well-distributed and relatively abundant population of the species in European Turkey (Demerdzhiev et al. 2011c). The surveys implemented on either side of the state border proved that the EIE is represented in Thrace by a meta-population of about 60–75 pairs distributed in south-eastern Bulgaria and European Turkey (Demerdzhiev et al. 2011a, b).

This article presents the distribution, numbers, breeding parameters, threats and food preferences of the EIE in the European part of Turkey, studied between 2008 and 2013. Thirty-two different occupied territories were discovered in the study period. The population was estimated at 35–45 pairs.

Materials and methods

Study areas

The studies were carried out in Thrace (Lower Thrace Lowlands), except for wooded areas of the Yıldız Mts. The terrain is hilly and flat, with an altitude from 0–460 m above sea level. The natural vegetation is represented by forests, mainly of downy oak (*Quercus pubescens*), holm oak (*Quercus ilex*), Turkey oak (*Quercus cerris*) and manna ash (*Fraxinus ornus*) (Natcheva et al. 2008). Since the natural vegetation has been widely modified by anthropogenic activities, these ecosystems occupy isolated patches scattered among arable areas (Mayer & Aksoy 1986). The shrubs of the Jerusalem thorn (*Paliurus spina-christi*) mixed with pistacia (*Pistacia* sp.), in combination with the xerothermal grass formations on dry pastures, provide suitable habitats for various bird species. Many of the riverbeds and valleys are still fringed by old trees of white poplar (*Populus alba*), willow (*Salix* sp.) and manna ash, which provide nesting conditions for birds of prey.

Field survey

The occupied territories were monitored three times per breeding period (March–August) in each year. The first visit took place in March–April to identify the territories occupied by pairs. The monitoring conducted in May was aimed at recording the pairs that had

started incubating. The breeding success was then recorded in July. Chicks at the age of more than 55 days were considered to be successfully reared. The search for new pairs and the inspection of suitable areas were carried out in March and April, when trees have no leaves and the nests are clearly visible from a great distance. Also, at that time of the year the eagles demonstrate clear territorial behaviour such as mating behaviour, display and defence of the breeding territory against other birds of prey. The inspections involved transect methods used mainly along river valleys or streams, or the examination of high trees in open habitats. Another method used during the inspections was observation from a viewpoint (Bibby et al. 1999, Andersen 2007). The surveys covered an area of 13,350 km², accounting for about 83% of the territory suitable for EIE breeding. Occupied territories, breeding pairs, the age structure of the population and the population breeding parameters were recorded on an annual basis. We estimated the breeding success (number of fledglings/breeding pair) and success rate (frequency of breeding attempts with at least one fledged chick), including 114 breeding attempts. Brood size was also recorded. The identification of plumage was done according to Forsman (2005). The birds were considered adults in the sixth calendar year. The pairs were classified into three categories: adult – consisting of two individuals in adult plumage; mixed – consisting of an individual in immature plumage (second-fifth) and an adult partner (from sixth plumage up); and immature – consisting of two individuals in immature plumage.

Food survey

The material was collected in 2008–2011 from 18 nest sites. Each breeding site was visited after the fledglings had left the nest (August–September). Food remains, bones, feathers and pellets were collected inside and under nests and perches (Katzner et al. 2005). A total of 186 pellets were collected. The material amounted to 1,513 bones and bone fragments belonging to 582 individual specimens. The collected material was determined through the comparative osteological collections of the National Museum of Natural History at the Bulgarian Academy of Science. Whenever possible, the minimum number of individuals (MNI) in each pellet or prey remain was estimated from the number of skeletal or keratinized body parts present (Katzner et al. 2005). The MNI was determined by taking into account the age (juvenis, subadultus, adultus), sex and size differences between individuals. The body mass of the specimens of

the various species was determined after Petrov (1964), Simeonov & Petrov (1980), Boev (1986), Simeonov et al. (1990), Böhme (1993), Kunstmüller (2000), Dunning (2008) and Aulagner et al. (2009). The average body mass was calculated on the basis of the average mass of the individual specimens. When the material was identified at the genus level, the average values for the presented species of the genus were considered. The percentage values were read to the 2nd digit after the decimal point. The carrion's biomass was not considered.

Statistical analysis

The statistical processing of data was carried out using the program Statistica for Windows, Release 7.0 (Statsoft 2004). The data was analysed for normal distribution through the Shapiro-Wilk test (Shapiro et al. 1968). Results with $p < 0.05$ [$\alpha = 5\%$] were considered significant. The non-parametric Mann-Whitney U-test and parametric T-test were used when comparing or seeking correlations between different variables.

Results

Breeding distribution and population

During the period 2008–2013, 32 different breeding territories were occupied (Fig. 1). Territories were mainly located in two regions: the Derwent Heights / Yıldız Mts. and the area to the north of the Marmara sea coast.

The region of the Derwent Heights / Yıldız Mts. harboured 13 breeding pairs distributed in 10 UTM squares. The EIEs from this region bred close to the Bulgarian border, avoiding the wooded areas of the Yıldız Mts. The second region was inhabited by 19 breeding pairs distributed in 17 UTM squares. During the study period, only one territory was lost and three newly formed pairs were recorded colonizing new territories (Fig. 2). In general, the birds were adult in 78% of the recorded cases of occupied territories, were mixed pairs in 19%, and only in two territories were the birds in immature pairs. There is no precise data on the replacement rate of the breeders over the years. However, the

Fig. 1. Breeding distribution of eastern imperial eagle in the European part of Turkey between 2008 and 2013 (black square – two pairs, black circle – one pair).

Obr. 1. Hniezdne rozšírenie orlov kráľovských v európskej časti Turecka v rokoch 2008 a 2013 (čierny štvorec – dva páry, čierny krúžok – jeden pár).

replacement of birds was recorded in at least four cases in four territories. The nearest neighbour distance established was 4.2 km. The mean distance between pairs was 10.44 ± 2.95 km.

Breeding success, success rate and brood size

The mean value of breeding success for the period 2008–2013, including 107 cases of incubation, was 1.01 ± 0.10 . The mean success rate was $69.2 \pm 46.4\%$. During the period 2008–2013, $40.5 \pm 13.4\%$ of the pairs, on average, had two chicks each. The mean proportion of one-chick broods was $54.9 \pm 14.6\%$. The frequency of three-chick broods was lower at $4.5 \pm 4.4\%$. There was no statistically significant difference ($t=0.86$, $df=105$, $p=0.39$) between the breeding success of the pairs nesting in the Derwent Heights/Yıldız Mts. ($n=46$ breeding attempts) and the pairs of the Marmara region ($n=61$ breeding attempts). However, the mean breeding success of birds in the Marmara region (1.05 ± 0.78) was greater than that in the other region (0.91 ± 0.84).

Mortality and threats

Brood mortality was surveyed between 2008 and 2013, including 38 breeding failures and the mortality of approximately 23 broods and 15 chicks (Tab. 1).

During the study periods, disturbance was among the major factors causing brood loss. Infertility was also one of the main reasons for breeding failure. The main reason for the loss of chicks during the study period was stormy weather and dropping from the nest. Cainism was reported in only one case of chick mortality. However, most of the cases of chick mortality remained unknown.

Fig. 2. Dynamics of the eastern imperial eagle population in period 2008–2013 (y axis – number of occupied territories).

Obr. 2. Dynamika populácie orlov kráľovských v období 2008–2013 (os y – počet obsadených teritórií).

Electrocution is one of the underestimated, but probably serious threats. Three of the immature eagles tagged with satellite transmitters in Bulgaria died as a result of electrocution in Turkey. Another juvenile EIE tagged with a satellite transmitter in European Turkey was found shot to the north of the town of Tekirdag. In the same region, a juvenile EIE tagged with a satellite transmitter in Bulgaria was recorded poisoned. Cutting of nest trees was also a serious threat. During the study period, three nest trees were found cut. Another such case was prevented shortly before the tree with the incubating eagle was to be cut. Treasure-hunting could be another reason for unsuccessful breeding. In 2008, the presence of treasure-hunters under one of the EIE nests built on an oak tree was the reason for the abandonment of the eggs.

Food preferences

The present study on the diet of the EIE was based on the remains of 582 prey items of at least 70 taxa. Mammals were the most common group with 46.5%, followed by birds with 32.4% and reptiles with 20.3%. In terms of biomass, birds provided 44.7%, followed by mammals (37.9%) and reptiles (17.4%). The white-breasted hedgehog (*Erinaceus roumanicus*) was the most common prey (Tab. 2), followed by two tortoise species – Hermann's tortoise (*Eurotestudo hermanni*) and the Greek tortoise (*Testudo graeca*) – which accounted for a total for 14.4% of the prey caught.

Both species were equally represented in the diet of the EIE. The prey species particularly represented in the food spectrum of the studied pairs were: the yellow-legged gull (*Larus michahellis*), the European souslik (*Spermophilus citellus*), the chicken (*Gallus gallus f. domestica*), and the white stork (*Ciconia ciconia*) (Tab. 2). All these species accounted for 67.8% of the prey caught. The species with the greatest contribution to the biomass were again the white-breasted hedgehog

Tab. 1. Brood mortality of eggs and chicks in period 2008–2013
Tab. 1. Mortalita vajec a mláďat v období 2008–2013

mortality / mortalita	eggs / vajcia	chicks / mláďatá
infertility / neplodnosť	8; 35%	
disturbance / vyrušovanie	9; 39%	
storm / búrka	1; 4%	3; 20%
unknown factors / neznáme faktory	5; 22%	8; 53%
cainism / kainizmus		1; 7%
dropping from the nest / vypadnutie z hniezda		3; 20%

and the tortoises, followed by the yellow-legged gull, the white stork, the chicken, the European hare (*Lepus europaeus*), the red fox (*Vulpes vulpes*) and the European souslik. These components constituted 84.5% of the total biomass. There was a statistically significant difference ($Z=2.52$, $p=0.01$) in the food preferences of the EIEs in the two studied regions. Almost half of the prey caught by eagles in the Derwent Heights / Yıldız Mts. were white-breasted hedgehogs (Tab. 2), followed by the tortoises, European sousliks, and yellow-legged gulls. In the Marmara region, the most common prey species was the yellow-legged gull, followed by the tortoises. However, the Greek tortoise was twice as common in the diet of the birds in the Marmara region compared with that of the Derwent Heights / Yıldız Mts. The European souslik was the third most common prey of EIEs in the Marmara region. The share of European souslik in the diet of the eagles in this region was twice as large as that in the Derwent Heights / Yıldız Mts. The white-breasted hedgehog ranked fourth among the prey species caught by the eagles in the Marmara region (Tab. 2). Also, an obvious difference in the food preferences of the eagles in the two regions was recorded in terms of voles. While accounting for 6.4% of the prey caught in the Marmara region, voles represented less than 1.0% in the Derwent Heights / Yıldız Mts.

Discussion

The EIEs breeding in European Turkey belong to a metapopulation of the species distributed across Thrace (Bulgaria and Turkey) (Demerdzhiev et al. 2011a, b). In European Turkey, the EIE is well represented in the two distribution areas, occupying suitable territories. The present study did not confirm breeding of EIEs along the lower reaches of the Maritsa River, where the species occurred in the 1960s (Warncke 1966, 1968, Wirth 1996). However, we observed an immature individual in a suitable habitat. The results of this study show that the population of the species in European Turkey, like the one in Bulgaria (Demerdzhiev 2011, Demerdzhiev et al. 2011a, b), is gradually increasing. However, in European Turkey there is no precise assessment of the replacement rate, which is an indirect indicator of the mortality of breeding birds. In general, the breeding density of the EIE in European Turkey was similar to that reported from Bulgaria (Demerdzhiev 2011).

The EIE population in Bulgaria had better breeding success for the period 2009–2013, which was probably due to the higher percentage of two-chick broods (Demerdzhiev et al. 2014). The smaller brood size in

European Turkey was probably due to the limited food resources. Moreover, the pairs in European Turkey were exposed to many more disturbances than the birds breeding in Bulgaria. This was particularly valid for birds breeding in the Derwent Heights / Yıldız Mts. region. Most of the nest trees were located in small corn-fields frequently visited by local farmers. Sometimes the eagles' nests are built at a height of only 6–8 m above the ground.

In general, the threats to the EIE in European Turkey have been insufficiently studied. Disturbance during the breeding season is one of the most important reasons for breeding failure. In Bulgaria, the guarding of nests during the breeding period increased the success rate by more than 20% and the breeding success of “risky” pairs by 35% (Demerdzhiev 2011). Electrocution is one of the factors probably causing high mortality, due to the fact that the power supply network in Turkey is made of facilities particularly dangerous for birds. The data gathered through satellite tracking of 20 juvenile EIEs from Bulgaria and two EIEs from European Turkey shows that more than half of the birds overwinter in different regions of Turkey. Since juvenile and immature birds are less experienced, they are exposed to a higher risk of electrocution. Juvenile EIEs from the Pannonian and the Macedonian population of the species also winter in Turkey (M. Horváth, E. Lisichanec, in litt.). Therefore, the insulation of hazardous electric poles in the wintering grounds in Turkey is crucial not only for the Thracian population of the EIE, but for the population of the species in Europe as well. The region to the north of the Sea of Marmara, located between the towns of Tekirdag and Çorlu, is an important stopover for EIEs during migration and a temporary settlement area during the winter period. The region harbours concentrations of five to twelve individuals in winter (author's unpubl. data). Therefore, this region is of global significance for the EIE. Four birds tagged with satellite transmitters were found dead in this region – one shot, one poisoned and the cause of death of the other two birds remains unknown. The recorded felling of nest trees is another factor limiting the population. In some suitable nesting habitats with abundant prey species the lack of suitable nest trees can be a limiting factor. Moreover, the birds may build a nest in the wrong unsafe place, which could result in breeding failure.

Since pastures are public property in Turkey, their land-use designation can be easily altered in the relevant management plans, and some of the key foraging habitats could be lost. Currently, some pastures are subject

Tab. 2. Diet composition of eastern imperial eagle in the European part of Turkey (n – number of prey item, p – presence, b – biomass)
Tab. 2. Zloženie potravy orlov kráľovských v európskej časti Turecka (n – počet položiek koristi, p – prezencia, b – biomasa)

taxa	Dervent / Yıldız			Marmara region			n	p [%]	b [%]
	n	p [%]	b [%]	n	p [%]	b [%]			
Orthoptera spp.	1	0.45					1	0.17	
Coleoptera spp.	2	0.90		2	0.56		4	0.69	
<i>Pseudopus apodus</i>	5	2.24	1.01	7	1.95	0.91	12	2.06	0.96
<i>Lacerta</i> sp	1	0.45	0.02				1	0.17	0.01
<i>Dolichophis caspius</i>	4	1.79	1.34	8	2.23	1.73	12	2.06	1.58
<i>Elaphe sauromates</i>	1	0.45	0.33	1	0.28	0.22	2	0.34	0.26
<i>Natrix natrix</i>	1	0.45	0.03				1	0.17	0.01
Serpentes spp.	1	0.45	0.33	4	1.11	0.87	5	0.86	0.66
<i>Mauremys rivulata</i>				1	0.28	0.14	1	0.17	0.09
<i>Eurotestudo hermanni</i>	17	7.56	5.34	21	5.85	6.21	38	6.53	5.87
<i>Testudo graeca</i>	9	4.04	4.01	29	8.08	8.23	38	6.53	6.57
<i>Testudo</i> spp.	4	1.79	1.78	4	1.11	1.16	8	1.37	1.40
<i>Anas platyrhynchos</i>				1	0.28	0.32	1	0.17	0.19
<i>Anser erythropus</i>	1	0.45	0.78				1	0.17	0.31
<i>Anser albifrons</i>				1	0.28	0.82	1	0.17	0.50
<i>Anser</i> spp.	2	0.90	0.96				2	0.34	0.38
<i>Ciconia ciconia</i>	8	3.59	12.29	11	3.06	10.67	19	3.26	11.30
<i>Accipiter nisus</i>				1	0.28	0.07	1	0.17	0.04
<i>Aquila pomarina</i>				1	0.28	0.40	1	0.17	0.24
<i>Buteo rufinus</i>	1	0.45	0.41				1	0.17	0.16
<i>Falco tinnunculus</i>	1	0.45	0.08				1	0.17	0.03
<i>Athene noctua</i>	2	0.90	0.15	1	0.28	0.05	3	0.52	0.09
<i>Asio otus</i>				2	0.56	0.17	2	0.34	0.10
<i>Gallus gallus</i> f. <i>domestica</i>	6	2.69	7.35	19	5.29	12.57	25	4.30	10.51
<i>Meleagris gallopavo</i> f. <i>domestica</i>	3	1.35	5.34	2	0.56	2.31	5	0.86	3.50
<i>Phasianus colchicus</i>				1	0.28	0.32	1	0.17	0.19
<i>Cairina moschata</i>				2	0.56	1.42	2	0.34	0.86
<i>Larus michahellis</i>	10	4.48	5.14	60	16.71	19.39	70	12.03	13.79
<i>Streptopelia decaocto</i>	1	0.45	0.07				1	0.17	0.03
<i>Columba palumbus</i>	1	0.45	0.22				1	0.17	0.09
<i>Cuculus canorus</i>	1	0.45	0.05				1	0.17	0.02
<i>Oenanthe oenanthe</i>	1	0.45	0.01				1	0.17	
<i>Turdus philomelos</i>				1	0.28	0.02	1	0.17	0.01
<i>Carduelis cannabina</i>				1	0.28	0.01	1	0.17	
<i>Sturnus vulgaris</i>	3	1.35	0.11	3	0.84	0.07	6	1.03	0.09
<i>Paser hispaniolensis</i>	1	0.45	0.01				1	0.17	
<i>Passer montanus</i>				2	0.56	0.01	2	0.34	0.01

to afforestation, especially in the western part of the species' range (Isfendiyaroğlu 2012).

Turkey's major investments, such as the third Bosphorus Bridge, the third Istanbul airport and the Canal Istanbul Project, which is planned to connect the Black Sea to the Marmara Sea, may result in the establishment and/or expansion of urbanized areas in Thrace. This is particularly valid for the territories in the Marmara Region, which, being located in the vicinities of populated areas, may be more likely to be affected by the expansion of the city centres. The establishment of wind power plants is another threat that could adversely affect the population, although the possible impacts of this in-

frastructure in the region have not been properly assessed (Isfendiyaroğlu 2012).

The effective conservation of the EIE in the European part of Turkey requires the implementation of a monitoring program, the gathering of information about the population status, detailed studying of the threats, detection of previously unknown breeding pairs as well as the realization of an awareness raising campaign among hunters and local people, emphasizing the significance of the EIE and the importance of the region for the population of this species.

In terms of food preferences, the EIE is an opportunistic species. Our data suggests that four prey compo-

Tab. 2. continuation

Tab. 2. pokračovanie

taxa	Dervent / Yıldız			Marmara region			n	p [%]	b [%]
	n	p [%]	b [%]	n	p [%]	b [%]			
<i>Passer</i> sp.				1	0.28	0.01	1	0.17	
<i>Emberiza</i> sp.				1	0.28	0.01	1	0.17	0.01
<i>Alauda arvensis</i>	1	0.45	0.02				1	0.17	0.01
Oscines non-Corvidae	1	0.45	0.05	2	0.56	0.07	3	0.52	0.06
<i>Corvus corax</i>	1	0.45	0.35	3	0.84	0.68	4	0.69	0.55
<i>Corvus monedula</i>	3	1.35	0.33	5	1.39	0.36	8	1.37	0.34
<i>Corvus frugilegus</i>				7	1.95	0.92	7	1.2	0.56
<i>Corvus cornix</i>	3	1.35	0.76	1	0.28	0.16	4	0.69	0.40
<i>Pica pica</i>	2	0.90	0.18	6	1.67	0.36	8	1.37	0.29
<i>Garrulus glandarius</i>				1	0.28	0.05	1	0.17	0.03
<i>Erinaceus roumanicus</i>	91	40.81	35.12	43	11.98	12.29	134	23.10	21.27
<i>Crocidura leucodon</i>				1	0.28	0.01	1	0.17	
<i>Crocidura suaveolens</i>				1	0.28		1	0.17	
<i>Lepus europaeus</i>	4	1.79	6.91	6	1.67	6.15	10	1.72	6.45
<i>Dryomys nitedula</i>				1	0.28	0.01	1	0.17	0.01
<i>Spermophilus citellus</i>	15	6.73	1.74	47	13.06	3.53	62	10.65	2.82
<i>Microtus arvalis</i>				4	1.11	0.03	4	0.69	0.02
<i>Microtus guentheri</i>				6	1.67	0.12	6	1.03	0.07
<i>Microtus subterraneus</i>				5	1.39	0.04	5	0.86	0.03
<i>Microtus rossiaemeridionalis</i>				4	1.11	0.03	4	0.69	0.02
<i>Microtus</i> sp.	1	0.45	0.01	4	1.11	0.03	5	0.86	0.03
<i>Micromys minutus</i>				3	0.84	0.01	3	0.52	
<i>Mus musculus</i>				1	0.28	0.01	1	0.17	0.01
<i>Mus macedonicus</i>				4	1.11	0.04	4	0.69	0.02
<i>Mus</i> sp.				1	0.28	0.01	1	0.17	0.01
<i>Rattus norvegicus</i>				1	0.28	0.06	1	0.17	0.04
<i>Nanospalax leucodon</i>	5	2.24	0.41	3	0.84	0.16	8	1.37	0.26
<i>Canis</i> sp.	2	0.90	2.57				2	0.34	1.01
<i>Canis aureus</i>				1	0.28	0.72	1	0.17	0.44
<i>Canis familiaris</i>	1	0.45	1.11	1	0.28	0.72	2	0.34	0.88
<i>Vulpes vulpes</i>	2	0.90	3.28	5	1.39	5.32	7	1.20	4.51
<i>Capra hircus domestica</i>	2	0.90		1	0.28		3	0.52	
<i>Bos taurus domestica</i>				1	0.28		1	0.17	
<i>Ovis musimon</i>	1	0.45					1	0.17	
<i>Capra hircus domestica</i> / <i>Ovis aries domestica</i>				2	0.56		2	0.34	
	223	100	100	359	100	100	582	100	100

nents – the white-breasted hedgehog, tortoises, the yellow-legged gull, and the European souslik – play an especially important role in the diet of the EIEs from the European part of Turkey. The chicken, the white stork and rodents are also very important. The white-breasted hedgehog, the European souslik and the white stork are typical prey species for the EIE population in Bulgaria (Demerdzhiev 2011). Tortoises are an alternative food source, proving the adaptability of the species. The share of tortoises in the diet of the neighbouring breeding pairs in Bulgaria is less than 1% (Demerdzhiev 2011). However, tortoises are represented by a high percentage in the food spectrum of EIEs

from the population in the FYR of Macedonia (E. Lisičanec pers. comm.). Habitat differences can explain the bigger share of the Greek tortoise in the diet of EIEs in the Marmara region than in that of the birds in the Dervent Heights / Yıldız Mts. region. The habitat of the Marmara region consists of plains areas with a mosaic of arable lands, some pastures and small rivers and streams. In Bulgaria, the Greek tortoise inhabits mainly open grasslands, unlike Hermann's tortoise, for which thin woods is typical (Beshkov, Naney 2002). The high percentage of yellow-legged gulls, especially in the diet of the pairs in the Marmara region, can be attributed to the proximity of the sea. Large flocks of dozens of gulls

foraging in this region are found inland at a distance of about 50 km and more from the coast and are an abundant food source used by the eagles. This diet shift towards yellow-legged gulls is another example of the foraging adaptability of EIEs. In Bulgaria, one of the EIE pairs breeding at a distance of 50 km from the Black Sea feeds mostly on yellow-legged gulls (Demerdzhiev 2011). What is particularly interesting is the low share of the European hare in the diet of the eagles in European Turkey. In Bulgaria, the European hare is the fourth most common prey of the EIE, and, together with the white-breasted hedgehog, accounts for the highest percentage of the biomass. The European hare is the most important prey of the diet in the Pannonian Basin (Chavko et al. 2007, Horvath et al. 2010, Horal 2011, Wichmann 2011), where its share has increased over the years. The low representation of the European hare as a prey of the EIE is probably due to the low density of the species in European Turkey.

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