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The Diet of a Lesser Spotted Eagle *Aquila pomarina* family in SE Bulgaria

Prehrana družine malega klinkača *Aquila pomarina* v JV Bolgariji

Boyan Milchev[1], Dragan Chobanov[2] & Nikolay Tzankov[3]

[1] University of Forestry, Wildlife Management Department, Kl. Ochridski Blvd. 10, BG–1756 Sofia, Bulgaria, e–mail: boyan.m@abv.bg

[2] Institute of Zoology, Tzar Osvoboditel 1, BG–1000 Sofia, Bulgaria, e–mail: d_chobanov@hotmail.com

[3] National Museum of Natural History, Tzar Osvoboditel 1, BG–1000 Sofia, Bulgaria, e–mail: n_tzankovbio@abv.bg

The diet of the Lesser Spotted Eagle *Aquila pomarina* during the breeding season predominantly includes small mammals, mainly voles Arvicolidae, followed by amphibians, small birds, and occasionally reptiles and large insects (Glutz von Blotzheim *et al.* 1971, Cramp 1980, del Hoyo *et al.* 1994). However, under the Mediterranean climate conditions, the diet can consist mainly of reptiles, followed by birds, insects and small mammals as demonstrated by a study carried out in Greece (Vlachos & Papageorgiou 1996). The diet of this species in Bulgaria is generally unknown, with some available data only on the stomach contents of six specimens that included Common Vole *Microtus arvalis*, European Souslik *Spermophilus citellus*, unidentified lizard, Slow-worm *Anguis fragilis* and Marsh Frog *Pelophylax ridibundus* (Simeonov *et al.* 1991). Here we present data on the diet composition of a Lesser Spotted Eagle pair, breeding in SE Bulgaria that successfully raised its offspring twice, in 2000 and 2001.

The breeding territory of the studied Lesser Spotted Eagle pair is located close to the town of Burgas, SE Bulgaria (UTM NG39). It comprises Mandra Lake and the adjacent marshy area, the Izvorska river valley with arable lands, surrounded by low hills predominantly covered with dry pastures, wastelands and patches of oak forest. This region is situated in the Transitory Mediterranean Climate Zone (Galabov 1982). The birds were not marked and occupied the same nest in the consecutive years. The distance from the nest to the forest edge was 100 m, measured by the GPS navigation device (Garmin eTrex Legend) and the computer software MapSource 6.11.6 (Garmin Ltd.). The percentage of major habitat types within the radius of 3 km around the nest, which corresponds to the mean activity range of the Lesser Spotted Eagle (Zub *et al.* 2010), were 77.4% open non-forest lands, 10.6% forest, 8.9% wetlands and 3.1% urban lands (villages and main road networks).

Pellets and food remains (single bones, skin, fur, feathers etc.) were collected from the nest and nearby resting places of adult birds during two visits per year, carried out in July and August 2000 and 2001. This corresponded to the second half of the breeding season (nestling period) and thus we minimized the possible negative impacts of the study on the breeding. The remains were identified by reference to our comparative collections kept in the National Museum of Natural History. Estimates of the minimum number of individuals (prey items, MNI) of vertebrates were based mainly on the remains of crania and cranial fragments, mandibles and pelvic bones, while the MNI of invertebrates was based on head fragments and mandibles. Difference in the number of prey items at the main animal group level in the two study years was tested using the χ^2 statistics.

The Lesser Spotted Eagle diet composition was assessed on the basis of 110 prey items classified into 27 different taxonomic categories (Table 1). The diet consisted of six main animal groups, among which small mammals (34.5%, range 25.4–46.8%) and insects (42.7%, range 27.7–54.0%) were most frequently identified in both years of the study. Far smaller was the share of reptiles, birds, amphibians and fish. Grasshopper *Decticus albifrons* (25.5%, range 17.0–31.7%) and vole *Microtus arvalis* / *rossiaemeridionalis* (21.8%, range 17.5–27.7%) were the most abundant species according to the number of prey items in our sample and the only ones that constituted over 10% of the total diet.

In spite of prevalence of voles in the diet of Lesser Spotted Eagle throughout Europe, the latter did not predominate in the diet here as strongly as in the northern and more humid parts of the species' range (Cramp 1980, del Hoyo *et al.* 1994). This was probably due to the fact that their numbers in SE Bulgaria are rather low (Straka & Gerasimov 1977), reflecting the opportunistic feeding habits of Lesser Spotted Eagle (Zub *et al.* 2010). Similarly, voles formed only 28% prey items in the diet of Barn Owl *Tyto alba*, another species that largely preys upon voles, studied in the same area (Miltschev *et al.* 2004). The most numerous prey species, the adult grasshopper *Decticus albifrons*, is about 5 cm long and was also represented in considerable numbers in the diet of Black Storks

Table 1: Diet of a Lesser Spotted Eagle *Aquila pomarina* family, based on pellets and food remains, collected from the nest (nestling period) and nearby resting places of adult birds near Burgas (SE Bulgaria) in July and August, 2000 and 2001 (N – No. of prey items, % – percentage of prey items)

Tabela 1: Prehrana družine malega klinkača *Aquila pomarina*, ugotovljena na podlagi izbljuvkov in ostankov hrane, zbranih na gnezdu (obdobje mladičev) in bližnjih počivališčih odraslih ptic pri Burgasu (JV Bolgarija) v juliju in avgustu 2000 in 2001 (N – št. enot plena, % – odstotek enot plena)

Prey item (Taxon)/ Enota plena (Sistematska enota)	2000		2001		Total / Skupaj	
	N	%	N	%	N	%
Erinaceus concolor	3	6.4	1	1.6	4	3.6
Talpa levantis	1	2.1			1	0.9
Neomys anomalus			1	1.6	1	0.9
Glis glis	1	2.1			1	0.9
Mus musculus / macedonicus	1	2.1			1	0.9
Sylvaemus flavicollis / sylvaticus			1	1.6	1	0.9
Microtus arvalis / rossiaemeridionalis	13	27.7	11	17.5	24	21.8
Rodentia spp.	3	6.4	2	3.2	5	4.5
Mammalia total / skupaj	22	46.8	16	25.4	38	34.5
Fringilla coelebs			1	1.6	1	0.9
Oscines spp.	4	8.5	1	1.6	5	4.5
Aves total / skupaj	4	8.5	2	3.2	6	5.5
Coluber caspius	2	4.3	2	3.2	4	3.6
Natrix tessellata			1	1.6	1	0.9
Natrix sp.	1	2.1	5	7.9	6	5.5
Lacerta viridis / trilineata	1	2.1	1	1.6	2	1.8
Reptilia total / skupaj	4	8.5	9	14.3	13	11.8
Pelophylax ridibunda	2	4.3	2	3.2	4	3.6
Amphibia subtotal	2	4.3	2	3.2	4	3.6
Carassius auratus	2	4.3			2	1.8
Pisces total / skupaj	2	4.3			2	1.8
Orthoptera						
Decticus albifrons	8	17.0	20	31.7	28	25.5
Platycleis escalerai			1	1.6	1	0.9
Platycleis incerta / nigrosignata	3	6.4	1	1.6	4	3.6
Metrioptera roeselii / fedtschenkoi			2	3.2	2	1.8
Gryllotalpa sp.			1	1.6	1	0.9
Calliptamus italicus / barbarus			1	1.6	1	0.9
Coleoptera						
Carabus coriaceus			2	3.2	2	1.8
Harpalus sp.	1	2.1	3	4.8	4	3.6
Aphodius sp.			2	3.2	2	1.8
Cetonia sp.	1	2.1			1	0.9
Cerambycidae			1	1.6	1	0.9
Insecta total / skupaj	13	27.7	34	54.0	47	42.7
Total / Skupaj	47	100.0	63	100.0	110	100.0

Ciconia nigra (Miltschev *et al.* 2000) and Rose-coloured Starlings *Sturnus roseus* (Miltschev & Tschobanov 2002) foraging in the same area. Given the fact that the studied eagle nest was situated close to the forest edge, our findings are in accordance with those of Zub *et al.* (2010) that Lesser Spotted Eagles nesting close to the forest edge and thus flying short distances between the nest and the hunting areas fed on smaller prey than birds nesting far from open non-forest areas suitable for hunting.

The relatively high proportion of snakes of the genus *Natrix* probably reflects their high numbers in and around the wet zones in the hunting territory. They usually predominate in reptilian portion of the diet in both the northern and southern parts of the Lesser Spotted Eagle range (Cramp 1980, Vlachos & Papageorgiou 1996). Other main animal groups in the diet were merely supplementary. The remains of Goldfish *Carassius auratus* showed only heads with small fragments of the spinal column. These were rather taken accidentally – probably as carrion, reported as exceptional by Glutz von Blotzheim *et al.* (1971) and Cramp (1980). In spite of the presence of wetlands in the pair's hunting territory, amphibians constituted only a small part of the diet. They are usually the second most important animal group in the diet of Lesser Spotted Eagle in Central and Eastern Europe, after small mammals (Glutz von Blotzheim *et al.* 1971). However, the amount of amphibians taken depends strongly on availability of voles. When vole populations are low, amphibians form up to 64% of the diet (Cramp 1980).

The difference in the proportion of the main six animal groups in the diet during the two consecutive years was statistically significant (χ^2_5 = 12.9, P = 0.025). The increased taking of insects in 2001 was related to a significant reduction in the number of mammals in the diet composition. The feeding habits of Lesser Spotted Eagles are considered opportunistic (Zub *et al.* 2010). Changes in prey species numbers and its accessibility between years should be the reason for the considerable annual differences in the diet. However, there were no data available on the population dynamics of the potential prey species of Lesser Spotted Eagle in the study area to confirm this hypothesis.

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Povzetek

Avtorji so v dveh gnezditvenih sezonah, v letih 2000 in 2001, preučevali prehrano družine malega klinkača *Aquila pomarina* pri Burgasu (JV Bolgarija). Izbljuvke in ostanke hrane so v juliju in avgustu obeh let zbrali na gnezdu ter bližnjih počivališčih odraslih ptic, kar se je časovno ujemalo z drugo polovico gnezdenja (mladiči v gnezdu). Sestavo prehrane so določili na podlagi 110 enot plena, ki so pripadale 27 različnim sistematskim enotam. Od glavnih živalskih skupin so v prehrani v obeh letih prevladovali mali sesalci (skupaj 34,5 % enot plena) in žuželke (skupaj 42,7 % enot plena). Najštevilčnejši vrsti sta bili kobilica primorska plenilka *Decticus albifrons* (25,5 %) in voluharica *Microtus arvalis* / *rossiaemeridionalis* (21,8 %). Razlika v številčnosti šestih glavnih živalskih skupin med letoma raziskave je statistično značilna. Ker je mali klinkač prehranski oportunist, so razlike v sestavi prehrane med letoma verjetno posledica sprememb v številčnosti posameznih vrst plena in njihove dostopnosti.

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