

## The diet of the Common Kestrel in the urban environment of the city of Nitra Potrava sokola myšiara v urbánnom prostredí mesta Nitra

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**Abstract:** The diet of the urban Common Kestrel population was studied in Nitra during 2003–2005. Totally, 671 prey items were identified by the analysis of pellets and prey remains collected under the nesting sites. Insect, mainly represented by order Coleoptera, was found to be the most abundant prey. Regarding biomass, the Common Vole (*Microtus arvalis*) was predominated. In comparison with other articles published, the studied sample was rather rich in the Lesser White-toothed Shrew (*Crocidura suaveolens*) and the House Mouse (*Mus cf. musculus*).

**Abstrakt:** V rokoch 2003–2005 bola sledovaná potrava urbánnej populácie sokola myšiara v Nitre. Rozborom vývržkov a potravných zvyškov zozbieraných pod hniezdnymi lokalitami bolo determinovaných 671 exemplárov koristi. Najpočetnejšou korisťou bol hmyz, reprezentovaný najmä radom Coleoptera, v biomase prevládal hraboš poľný (*Microtus arvalis*). Pri porovnaní výsledkov s publikovanými prácami boli v sledovanej vzorke výraznejšie zastúpené bielozubky krpaté (*Crocidura suaveolens*) a myši domové (*Mus cf. musculus*).

**Key words:** Kestrel, *Falco tinnunculus*, food, Slovakia

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### Introduction

Feeding ecology is nowadays an inseparable part of the research of raptors and owls. Starting with providing the elementary data (e.g. the species spectrum of prey and its abundance and its representation by biomass), the feeding ecology gradually brings more detailed analysis showing the differences in feeding behaviour in various time periods, individual variations, differences in food of the adults and the young as well as the importance of individual prey components.

The Common Kestrel (*Falco tinnunculus*) is our most abundant breeding falcon species with a significant level of nesting opportunism. Its relative abundance, availability of nests as well as a synanthropic way of life of a part of the breeding population provides a good base for studying feeding ecology of the species.

Complex information on the diet of the Common Kestrel is published by Uttendorfer (1939, 1952), Plesník (1992), Korpimäki (1985). Romanowski (1996) was studying the diet of the species in Poland. Detailed analysis

of the food spectrum, foraging success and foraging behaviour were published by Riegert (Riegert & Fuchs 2004, Riegert et al. 2007).

Feeding ecology of the Common Kestrel was of a minor interest to authors in Slovakia. General information is published in the elementary ornithological papers (e.g. Ferianc 1964), some aspects are described in more detail in Matoušek (1964). Diet of the Common Kestrel population in Bratislava was studied by Darolová (1988, 1989) as a part of a complex study of the species in the city; Soviš (1995) focused on the differences in the diet of the Common Kestrel pairs dwelling in urban and suburban areas.

### Material and methods

Pellets and food remains were collected after in the period November 2003 – February 2005 at 9 nesting sites in Nitra (Tab. 1) as a part of a complex study of the species there (Kečkéšová 2005). Pellets collected at the SAU (a building of the Slovak Agricultural University)

site were collected under 2 nests as well as under the perches, which did not necessarily have to be occupied by the same individuals. To facilitate the location of the sites where samples were collected, quadrates of Slovak Fauna Databank (Databanka Fauny Slovenska – DFS) are stated for each site.

Obtained material was processed in 5% NaOH solution (Obuch 1994). Birds (Aves) and mammals (Mammalia) in the sample were determined to species level. Other animals, excluding 2 invertebrate species, which were easily distinguishable by colour, were determined to genus, families or other higher taxonomic groups. Humerus, tarsometatarsus, metacarpus, beak and skull were used in bird determination. Skulls, lower jaws, bones of the arm (mole) and forearm (bats) were used in mammal determination. In reptiles, the determination was based on jaws. The number of invertebrates (Evertebrata) in the sample was based on the number of heads present.

Biomass of individual prey items was identified in correspondence with the available bibliography sources (Anděra & Horáček 1982; Ferianc 1964, 1965; Romanowski 1996).

The method of marked differences from the mean (MDFM) described in Obuch (1991, 2001) was used to assess the differences and similarities in the food spectrum. Rearranged tables were used, but the less frequent specimen in table 3 are assorted in correspondence with the zoological system.

## Results

671 prey items were determined (Tab. 2). Mammals represented 28.02 %, birds almost 3 % (2.98 %), reptiles 0.30 % and invertebrates 68.70 %. Mammals and birds

dominated by biomass. Regarding biomass *Microtus arvalis* (55.77 %), *Cricetus cricetus* (10.73 %) and *Columba livia* forma *domestica* (16.10 %) were eudominant. Mammals represented more than two thirds of prey biomass (74.24 %), birds 24.76 % and insect represented only 0.59 % of prey biomass.

With respect to vertebrates, Common Vole (*Microtus arvalis*) was the most frequent prey, which proves the assumption that it represents a eudominant food item even in the urban environment. House mice were also abundant, as was, surprisingly the Lesser White-toothed Shrew (*Crocidura suaveolens*), too. This species occurs in the predator diet only sporadically and is more frequent only in the Barn Owls pellets (Noga 2005). It is very likely that kestrels also forage in the agricultural grounds in the vicinity of the city.

An interesting prey item recorded in the Common Kestrel's diet was the presence of two adult European Hamsters, which are quite a big prey for a kestrel not to mention that they can vigorously defend themselves. A single record of a Noctule Bat (*Nyctalus noctula*) proves an opportunistic foraging of kestrels on bats.

With respect to pigeon nuisance problems in cities, a record of the remains of 3 pigeons (*Columba livia* forma *domestica*) in the Common Kestrel diet is negligible. Although the Common Kestrel is not a major pigeon predator, its presence can restrain the presence of pigeons at its nesting grounds.

An increased representation (1+) of a Common Vole (*Microtus arvalis*) in two samples from the SAU (the Slovak Agricultural University, Nitra) vicinity is proportional to low representation of beetles (Coleoptera). A high portion of small mammals (Mammalia) was recorded in

Tab. 1. Sites where the Common Kestrel (*Falco tinnunculus*) pellets were collected

Tab. 1. Lokality zberu vývržkov sokola myšiara (*Falco tinnunculus*)

No. of site / Číslo lokality	Site / Lokalita	Date / Dátum	No. of DFS quadrat / Číslo kvadrátu DFS
1		XI.–XII. 2003, III. 2004, II. 2005	
2		XI.–XII. 2003; III., VIII., XI., 2004; II. 2005	
3	SAU <sup>1</sup> Building	XI.–XII. 2003; III., XI. 2004; II. 2005	
4		XI.–XII. 2003; III., V., VIII. 2004; II. 2005	7674 D
5		XI.–XII. 2003, III. 2004, II. 2005	
6	Ľ. Okánik street	VI.–VII. 2004	
7	Tríbečská street	VIII. 2004	
8	Ľ. Čulák street	X.–XI. 2004	
9	Faculty hospital <sup>2</sup>	IX.–X. 2004, I. 2005	7774 B

<sup>1</sup> Slovak Agriculture University / SPU – Slovenská poľnohospodárska univerzita; <sup>2</sup> Fakultná nemocnica

**Tab. 2.** The Common Kestrel's (*Falco tinnuculus*) diet at studied sites**Tab. 2.** Potrava sokola myšiara (*Falco tinnuculus*) na sledovaných lokalitách

Species\ Sites	2		3		5		1		4		7		9		8		6		Σ	%
<i>Microtus arvalis</i>	ind.	1+	22	1+	32		10	19	1-	30	1-	1	30	5	5	5	154	22.95		
	%		62.9		45.7		26.3	34.5		11.7		3.2	25.4	14.3	15.6	23.0				
<i>Crociodura suaveolens</i>			1		2	1+	6			2									11	1.64
Coleoptera sp.	ind.	1-	8	1-	35	1-	13	29		206		18	87	29	25	450	67.06			
	%		22.9		50.0		34.2	52.7		80.2		58.1	73.7	82.9	78.1	67.1				
<i>Mus cf. musculus</i>			3			3	1	5					1				13	1.94		
<i>Talpa europaea</i>										1							1	0.15		
<i>Sorex minutus</i>										1							1	0.15		
<i>Nyctalus noctula</i>							1										1	0.15		
<i>Micromys minutus</i>										1							1	0.15		
<i>Apodemus sylvaticus</i>			1				1	1									3	0.45		
<i>Cricetus cricetus</i>						1	1										2	0.30		
<i>Clethrionomys glareolus</i>										1							1	0.15		
<i>Columba livia domestica</i>													3				3	0.45		
<i>Melopsittacus undulatus</i>					1												1	0.15		
<i>Alauda arvensis</i>										1							1	0.15		
<i>Hirundo rustica</i>													1				1	0.15		
<i>Motacilla alba</i>							1										1	0.15		
<i>Erithacus rubecula</i>												1					1	0.15		
<i>Turdus merula</i>										1		1			1		3	0.45		
<i>Fringilla coelebs</i>												1					1	0.15		
<i>Passer domesticus</i>							1										1	0.15		
<i>Passer montanus</i>						1	1					1					3	0.45		
Passeriformes sp.										2				1	1		4	0.60		
<i>Lacerta</i> sp.													2				2	0.30		
<i>Pyrhocoris apterus</i>										1							1	0.15		
<i>Cetonia aurata</i>													2				2	0.30		
Orthoptera sp.							4			3							7	1.04		
Hymenoptera sp.										1							1	0.15		
<b>Mammalia</b>		1+	27	1+	34	1+	20	1+	23	1-	42	1-	1	31	5	5	188	28.02		
<b>Aves</b>			0		1		1		3		4	1+	8	0	1	2	20	2.98		
<b>Reptilia</b>			0		0		0		0		0		2	0	0	0	2	0.30		
<b>Evertebrata</b>		1-	8	1-	35	1-	17		29		211		20	87	29	25	461	68.70		
Σ			35		70		38		55		257		31	118	35	32	671	100.00		
Diversity index H'			1.04		0.87		1.64		1.21		0.83		1.56	0.61	0.54	0.70	1.11			

Site numbers follow Tab. 1 / Číslo lokalit sú uvedené podľa Tab. 1

4 out of 5 samples from the SAU site and an increased portion of birds (Aves) was recorded at one site ("Tríbečská" Street). These facts do not necessarily have to imply a different foraging strategy or food specialization, but may be related to the origin of the pellets. The samples with a high portion of beetles (at 4 sites) may have come from young birds, which tend to forage on beetles more than adult birds (Riegert & 2004).

## Discussion

In comparison with the data presented by other authors (Tab. 3), the studied sample is rich in beetles (Coleoptera). Regarding the prey dominating by biomass (mammals, birds), an increased representation of the Lesser White-toothed Shrew (*Crociodura suaveolens*) and the House Mouse (*Mus cf. musculus*) was recorded in the studied sample in Nitra.

**Tab. 3.** Comparison of the Common Kestrel's (*Falco tinnunculus*) diet in four cities**Tab. 3.** Porovnanie potravy sokola myšiara (*Falco tinnunculus*) v štyroch rôznych mestách

Species \ Sites	Nitra		Bratislava		Warsawa <sup>1</sup>		Č. Budějovice <sup>2</sup>		Σ	%
Coleoptera sp.	2+	450	5-	0	1-	83	1-	601	1134	15.23
<i>Crocidura suaveolens</i>	2+	11					1-	0	11	0.15
<i>Mus cf. musculus</i>	1+	13	2+	21		8	3-	0	42	0.56
Aves sp.			2+	16			2-	0	16	0.21
<i>Apodemus</i> sp.			1+	8			1-	0	8	0.11
<i>Lacerta</i> sp.		2	2+	19			2-	0	21	0.28
<i>Columba livia domestica</i>		3	2+	11			2-	0	14	0.19
<i>Turdus merula</i>		3	1+	6			1-	0	9	0.12
<i>Passer domesticus</i>	2-	1	3+	82	1+	44	5-	0	127	1.71
<i>Passer</i> sp.					1+	8	1-	0	8	0.11
<i>Apodemus agrarius</i>					1+	9	1-	0	9	0.12
Passeriformes sp.		4		7	2+	35	4-	0	46	0.62
Orthoptera sp.	1-	7	3-	0	3-	0	1+	190	197	2.65
Mammalia sp.	4-	0	3-	3	4-	0	1+	362	365	4.90
<i>Microtus arvalis</i>	2-	154		427		719		4073	5373	72.17
<i>Passer montanus</i>		3		4		2	1-	0	9	0.12
<i>Micromys minutus</i>		1		3					4	0.05
<i>Talpa europaea</i>		1		2		1			4	0.05
<i>Apodemus sylvaticus</i>		3							3	0.04
<b>Mammalia</b>	2-	<b>188</b>		<b>464</b>		<b>738</b>		<b>4073</b>	<b>5463</b>	<b>73.38</b>
<b>Aves</b>		<b>20</b>	3+	<b>138</b>	2+	<b>97</b>	6-	<b>0</b>	<b>255</b>	<b>3.43</b>
<b>Amphibia, Reptilia, Pisces</b>		<b>2</b>	2+	<b>20</b>		<b>0</b>	2-	<b>0</b>	<b>22</b>	<b>0.30</b>
<b>Evertebrata</b>	2+	<b>461</b>	5-	<b>0</b>	1-	<b>83</b>		<b>796</b>	<b>1340</b>	<b>18.00</b>
Σ		<b>671</b>		<b>625</b>		<b>918</b>		<b>5231</b>	<b>7445</b>	<b>100.00</b>
Diversity index / Index diverzity H'		1.11		1.32		0.89		0.76	1.05	

<sup>1</sup>Romanovski (1996), <sup>2</sup>Riegert & Fuchs (2004)

Concerning biomass, the percentage representation of a Common Vole (*Microtus arvalis*) was lower in Nitra than in other compared sites – Warsaw and České Budějovice. While in Nitra the Common Vole represented only 55.5 % of the total prey biomass, in Warsaw it was 78.9 % and in České Budějovice as high as 94.5 %.

Diet of the Common Kestrel in the urban environment of the city of Nitra was studied by Soviš (1995) from 1989–1991. In a sample comprising of 124 prey items, he identified 2 mammal species (Common Vole *Microtus arvalis*, Common Shrew *Sorex araneus*), 4 bird species (Tree Sparrow *Passer montanus*, Crested Lark *Galerida cristata*, Chaffinch *Fringilla coelebs*, Black Redstart *Phoenicurus ochruros*), 1 reptile (Sand Lizard *Lacerta agillis*) and a single insect species (*Melolontha melolontha*). Besides the pellet analysis, Soviš (1995) also studied food brought to the nest (23 observations) and recorded the following species *Mus musculus*, *Apodemus* sp., *Turdus merula*. If one would combine and compare

these samples with samples collected during 2003–2005 (Tab. 4), beetles (Coleoptera) would turn out to be more abundant in the recent samples while the Common Vole (*Microtus arvalis*) and the House Sparrow would be more abundant in the sample of the previous study.

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**Tab. 4.** Comparison of the Common Kestrel's (*Falco tinnunculus*) diet in Nitra in two different time periods**Tab. 4.** Porovnanie potravného spektra sokola myšiara (*Falco tinnunculus*) z Nítry z dvoch rôznych časových období

Species / Time period Druh / Obdobie	2003–2005		1989–1991		Σ	%
Coleoptera sp.	1+	450	4-	4	454	47.10
<i>Passer domesticus</i>	2-	1	1+	25	26	2.70
<i>Microtus arvalis</i>	1-	154	1+	243	397	41.18
<i>Mus cf. musculus</i>		13		2	15	1.56
<i>Crocodyra suaveolens</i>		11			11	1.14
Orthoptera sp.		8			8	0.73
<i>Turdus merula</i>		3		3	6	0.62
Passeriformes sp.		4			4	0.41
<i>Lacerta</i> sp.		2		5	7	0.52
<b>Mammalia</b>	<b>1-</b>	<b>188</b>	<b>1+</b>	<b>249</b>	<b>437</b>	<b>45.33</b>
<b>Aves</b>	<b>1-</b>	<b>20</b>	<b>1+</b>	<b>33</b>	<b>53</b>	<b>5.50</b>
<b>Reptilia</b>		<b>2</b>		<b>5</b>	<b>7</b>	<b>0.73</b>
<b>Evertebrata</b>	<b>1+</b>	<b>461</b>	<b>4-</b>	<b>4</b>	<b>467</b>	<b>48.44</b>
Σ		<b>671</b>		<b>293</b>	<b>964</b>	<b>100.00</b>
Diversity index / Index diverzity H'		1.11		0.76	1.3	

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