Slovak Raptor Journal 2013, 7: 59–71. 10.2478/srj-2013-0003.

VERSITA

Diet of the Ural owl (*Strix uralensis*) in Slovakia

Potrava sovy dlhochvostej (*Strix uralensis*) na Slovensku

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Abstract: A Central European subspecies of the Ural owl *Strix uralensis macroura* (Wolf, 1810) is widespread in the territory of Slovakia. The work presents unpublished data on the diet of this subspecies from several territorial units of eastern and northern Slovakia, obtained from pellets and the nest linings in boxes (1,564 pieces). There is less data about prey brought to young in the nest but still not yet consumed (137 pieces). Published data from analysis of the stomachs of dead and shot owls come from the first six decades of the 20th century. Together with existing published data, 2,134 pieces of the diet of *S. uralensis* from Slovakia are evaluated. They indicate the dominance of non-forest species *Microtus arvalis* and a more plentiful representation of larger species of prey: *Lepus europaeus*, *Sciurus vulgaris* and *Corvus* sp. In upper Orava the diet of young *S. uralensis* also consists of frogs *Rana temporaria*, moles *Talpa europaea* and mountain species of rodents: *Microtus agrestis*, *M. subterraneus*, *Sicista betulina* and *Arvicola amphibius*. In data from the mountains of central Slovakia the *Clethrionomys glareolus* has high abundance, and in eastern Slovakia the *Apodemus flavicollis* and *A. agrarius* are more represented, and in the lowlands also the *Cricetus cricetus*. Upon evaluation of material from the entire breeding grounds of *S. uralensis* it can be deduced that the basic diet consist of mammals (88.6%) from the orders Soricomorpha and Rodentia. In the countries of Central Europe the species *M. arvalis*, *M. subterraneus*, *A. flavicollis* and *Muscardinus avellanarius* are more abundantly represented, and in the Baltic states the species *Sorex araneus*, *M. agrestis*, *M. oeconomus* and *M. rossiaemeridionalis*. The species *S. betulina* and *A. agrarius* occur in the diet of *S. uralensis* from Central Europe up through the Far East.

Abstrakt: Na území Slovenska je rozšírený stredoeurópsky poddruh sovy dlhochvostej *Strix uralensis macroura* (Wolf, 1810). V práci sa uvádzajú nepublikované údaje o potrave tohto poddruhu z niektorých územných celkov východného a severného Slovenska, získané z vývržkov a z hniezdnych výstielok v búdkach (1564 kusov). Menej údajov je o koristi, prinesenej mláďatám na hniezdo, ale ešte neskonzumovanej (137 kusov). Publikované dáta z rozborov žalúdkov uhynutých a zastrelených sov pochádzajú z prvých 6 dekád 20. storočia. Spolu s doteraz publikovanými údajmi sa vyhodnocuje zo Slovenska 2134 kusov potravy *S. uralensis*. Vyznačujú sa dominanciou nelesného druhu *Microtus arvalis* a početnejším zastúpením väčších druhov koristi: *Lepus europaeus*, *Sciurus vulgaris* a *Corvus* sp. Na hornej Orave sú častou potravou mláďat *S. uralensis* žaby *Rana temporaria*, krty *Talpa europaea* a horské druhy hlodavcov: *Microtus agrestis*, *M. subterraneus*, *Sicista betulina* a *Arvicola amphibius*. V údajoch zo stredoslovenských pohorí má vysokú abundanciu druh *Clethrionomys glareolus*, na východnom Slovensku sú viac zastúpené ryšavky *Apodemus flavicollis* a *A. agrarius*, na nížine tiež druh *Cricetus cricetus*. Pri vyhodnotení materiálu z celého hniezdneho areálu *S. uralensis* sa usudzuje, že základnou potravou sú cicavce (88,6 %) z radov Soricomorpha a Rodentia. V krajinách strednej Európy sú početnejšie zastúpené druhy *M. arvalis*, *M. subterraneus*, *A. flavicollis* a *Muscardinus avellanarius*, v pobaltských štátoch druhy *Sorex araneus*, *M. agrestis*, *M. oeconomus* a *M. rossiaemeridionalis*. Druhy *S. betulina* a *A. agrarius* sa vyskytujú v potrave *S. uralensis* od strednej Európy po Ďaleký východ.

Key words: food ecology, pellets, prey in nests

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Acknowledgement: Ján Hoľma, Ján Lipták, Radoslav Michalec and Vladimír Michalec all helped with the checking of nests and boxes of Ural owls, and pellets were collected by Peter Krišovský, Štefan Pčola and Vladimír Thomka. We herein wish to thank everyone for their cooperation. We also wish to thank Miroslav Dravecký for help with obtaining the relevant literature.

Introduction

The Ural owl (*Strix uralensis* Linnaeus, 1758) is widespread in the woodland zone of the Eurasian subcontinent from Scandinavia through to Japan. In Central Europe the subspecies *Strix uralensis macroura* (Wolf, 1810) (Mebs & Scherzinger 2008) has a scattered, discontinuous area. In Slovakia it spreads from the Ukrainian, Hungarian and the Polish borders through to north-western Slovakia (Kysuce), in the west through the Strážovské vrchy Mts. and in south-central Slovakia through the Revúcka vrchovina Uplands and the Poľana massif. It inhabits broad-leaved oak, oak-beech and beech forests (Fig. 1–5) as well as mixed fir-beech and spruce forests (Fig. 6–7) at elevations of 150 m to 1,300 m. Typical mountain ranges with an abundant population are, for example, the Vihorlatské, Slanské and Volovské vrchy Mts. (Danko et al. 2002, Krištín et al. 2007).

The first knowledge about the diet of this species in the territory of the former Hungarian monarchy on the basis of analysis of stomachs was presented by Hrabár (1904) and Greschik (1911, 1924). Hrabár (1926) continued in researching the stomach contents of 22 shot individuals in the territory of today's eastern Slovakia from 1906–1923. Sládek (1961, 1962) studied the diet of this owl in eastern Slovakia with an analysis of 16 stomachs, and Hell (1964) published data on the contents of six stomachs of this species of owl. The stomachs were predominantly from individuals that died during winter periods; a significant number of the stomachs were empty and the main prey found was the common vole (*Microtus arvalis*). Bauer & Tichý (1960) surveyed the diet of *S. uralensis* on the Rožok hill near Ubľa by checking its nests in the years 1957–1959. The forest rodents *Clethrionomys glareolus* and *Apodemus flavicollis* dominated accordingly, as in newer works on the diet of this owl during the breeding period (Danko 1987, Adamec et al. 2003, Bučko 2004, Šotnár 2005). Dravecký & Obuch (2009) present the diet of one wintering individual in the centre of Košice, which hunted other birds exclusively. Smrčo (2008) does not present the results of his own analysis of pellets, but later writes about observations of *S. uralensis* during hunting (Smrčo 2009a, b). Obuch (2011) included published and his own data in a comparison with the diet of *Strix aluco*. From the European part of its breeding distribution the diet has been studied in the Czech Republic (Kloubec et al. 2005), in Poland (Czuchnowski 1997), Hungary (Jánossy et al. 1992, Petrovics 2007), Finland (Korpimäki & Sulkava 1987), Sweden (Lundberg 1976), Norway (Mysterud & Hagen 1969), Latvia (Avotins in litt.), Russia – the Kaliningrad Region (Uttendörfer 1939), Belarus (Sidorovich et al. 2003, Tishechkin 1997) and in Slovenia (Vrezec 2001). Shokhrin (2009) published data from the Sikhote-Alin Mts., from the Asian part of Russia, and Ryabtsev & Rezin (2009) from western Pribaikalye. Data from the mentioned works are included in a comparison with the diet of *S. uralensis* in Slovakia.

The aim of the work is (1) to present the results of study of the diet of *Strix uralensis* and to evaluate them in common with published data from the territory of Slovakia, and (2) to outline the differences in the relative representation of the types of prey. In the territory of Slovakia results are influenced by the method of acquiring data (from pellets, from the stomach contents, from stores in nests), but also their spatial and temporal structuring. The Slovakian data are compared in summary with data from other countries in the literature.

Material and methods

In the year 1969 the nests of *S. uralensis* in eastern Slovakia began being checked. During these checks the prey found in the nests was recorded. Smaller numbers of pellets were collected beneath nests or beneath boxes in which there were young birds. In view of the fact that the species usually does not permanently have a place for daily rest, it is not possible to collect a larger quantity of pellets, for example beneath trees. More comprehensive documented material was obtained after the hanging of boxes. After nesting the linings from 7 boxes were taken, consisting of pellets and the remnants of the food of young birds. The results from sporadic pellet collections found occasionally beneath resting places for owls or from pellets forming the lining inside boxes with young are presented according to the orographic units in eastern Slovakia (Košická kotlina Basin – 33.3%, Slanské vrchy Mts. – 20.8%, Laborecká vrchovina Uplands and the Východoslovenská pahorkatina Hills – 12.5%, Vihorlatské vrchy Mts. – 8.3%, and the Bukovské vrchy Mts., Čergov and Levočské vrchy Mts. – 4.2%). In north-western Slovakia material was obtained from the breeding period in upper Orava (seven collections of pellets in the surroundings of boxes and one nest lining from the boxes) and pellets from two collections from the winter period in the Turiec Region.

The pellets and nest linings were soaked in a 5% solution of NaOH and by rinsing in water pure osteological material was obtained. For identification, the mandibles and maxillas of mammals were sorted out, as were the beaks, humerus, metacarpus and tarsometatar-

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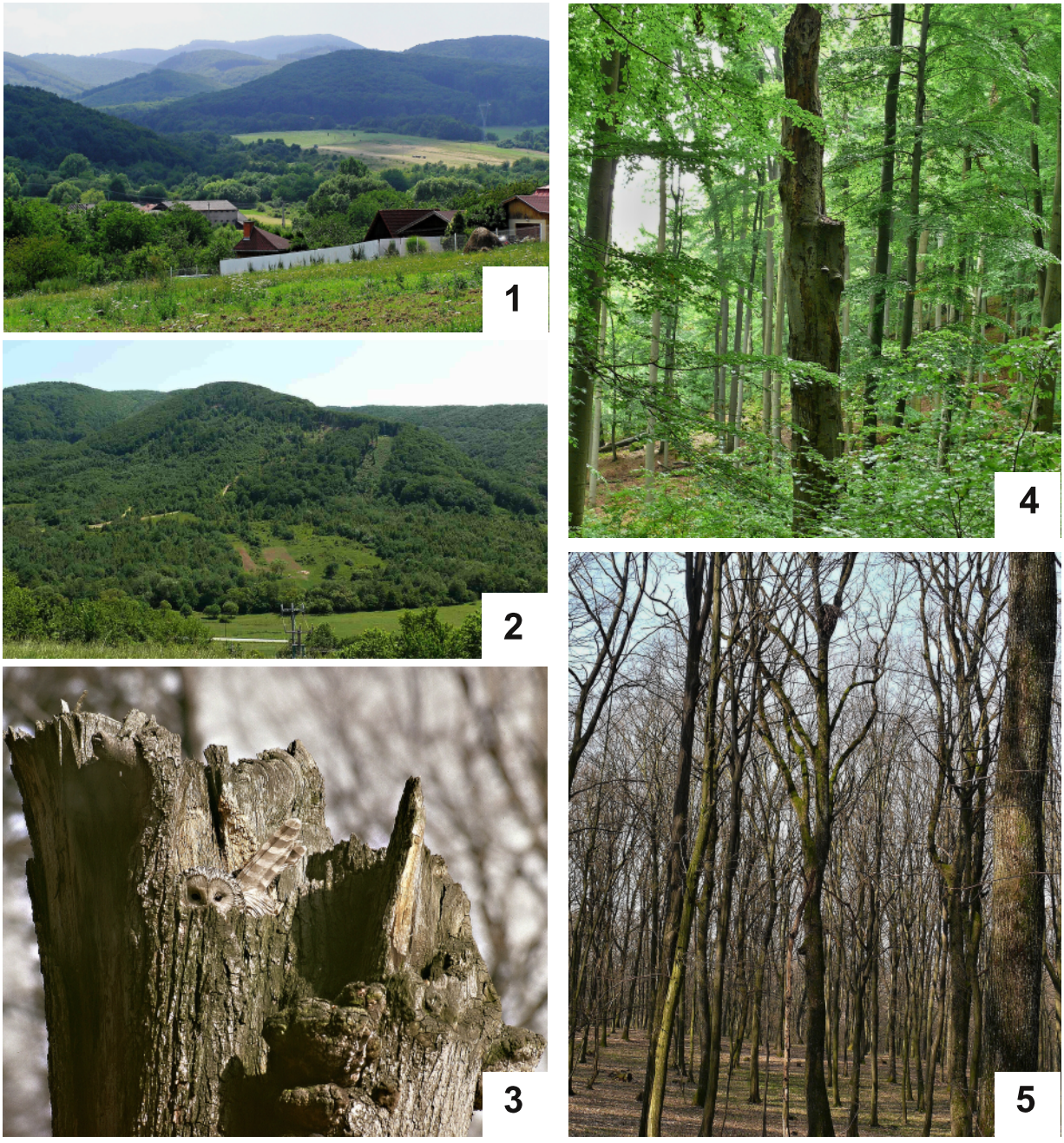

Š Danko (5)

Fig. 1–5. The character of hunting and breeding grounds of Ural owls (*Strix uralensis*) in the conditions of the Carpathians in eastern Slovakia in the Slanské and Vihorlatské Mts. with elevations from 200–800 m. The environments are made up of broad-leaved forests with a predominance of beech and oak, where the owls nest in natural hollows (3, 4) or in the natural nests of raptors (5). For obtaining prey a rich structured environment is needed with the presence of the open spaces of clearings, clear-cut forests, meadows; sometimes they also hunt in the vicinity of human habitation (1, 2).

Obr. 1–5. Charakter hniezdneho a lovného prostredia sov dlhochvostých (*Strix uralensis*) v podmienkach Karpát na východnom Slovensku v pohoriach Slanských a Vihorlatských vrchov s nadmorskou výškou od 200–800 m. Prostredie tvoria listnaté lesy s prevahou buka a duba, kde sovy hniezdia v prirodzených dutinách (3, 4) alebo v prirodzených hniezdach dravcov (5). K získavaniu koristi potrebuje bohato štruktúrované prostredie s prítomnosťou otvorených plôch čistiniek, rúbaní, lúk a niekedy loví aj v blízkosti ľudských obydlí (1, 2).

J Hoľma (2)

Fig. 6–7. The different character of hunting and breeding grounds of Ural owls (*Strix uralensis*) in the conditions of the Carpathians in northern Slovakia, in the Skorušinské vrchy Mts. and the Západné Tatry Mts. with elevations from 700–1,000 m. The environment is made up of coniferous forests with a predominance of spruce (6), where owls often breed in installed boxes (7). For obtaining prey a segmented environment is needed with the presence of the open spaces of clearings, clear-cut forests and meadows.
Obr. 6–7. Odlišný charakter lovného a hniezdneho prostredia sov dlhochvostých (*Strix uralensis*) v podmienkach Karpát na severnom Slovensku v pohoriach Skorušinské vrchy a Západné Tatry s nadmorskou výškou od 700–1000 m. Prostredie tvoria ihličnaté lesy s prevahou smreka (6), kde sovy hniezdia často v inštalovaných búdkach (7). K získavaniu koristi potrebuje členité prostredie s prítomnosťou otvorených plôch čistiniek, rúbaní a lúk.

sus of birds, the os ilium of frogs and the heads of insects. According to the most numerous identified parts of the body of each taxon, its minimum count in the sample was determined. With the evaluation of data, the method of marked differences from the mean was used (MDFM, Obuch 2001). In the work the names of the orographic units are presented according to the Databank of Fauna of Slovakia (Kroupová 1980). Diversity index H' (Shannon & Weaver 1949) is given in the bottom row of the appendices 1–3.

Results and discussion

The majority of material comes from the Košická kotlina Basin and the Východoslovenská pahorkatina Hills, with minority being from the other mountain ranges of eastern Slovakia. During the checking of nests and boxes in the orographic units in eastern Slovakia, rarely also by observations of adult birds during hunting or bringing prey to the nest for its young, 137 pieces of prey were discovered, of which mammals made up 77.4% and birds 22.6% of the dietary items (Tab. 1). Data come primarily from the orographic units of the Slanské vrchy Mts. and the Volovské vrchy Mts. Through analysis of pellets and nest linings, 26 species of mammals totalling 1,390 pieces (88.9%), 25 species of birds totalling 108 pieces (6.9%), two species of frogs and invertebrates from the orders Coleoptera and Orthoptera (Tab. 2) were found among a total of 1,564 pieces of prey.

In Appendix 1 the samples of the dietary spectra are arranged by similarity in the represented diagnostic species with a significantly higher share (+MDFM, Obuch 2001) than is the Slovakia-wide average. The use of our own results with a comparison of data from the literature on the diet of *S. uralensis* points to differences in the relative representation of species of prey, which are influenced in the territory of Slovakia in part by the method of obtaining data (from pellets, from stomach contents, from stores in nests), but also their spatial and temporal structuring. In urban environments *S. uralensis* can specialise. In Košice, for instance, in the course of wintering in the city it hunted exclusively birds, particularly Eurasian collared doves (*Streptopelia decaocto*) and domestic pigeons (*Columba livia domestica*)

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(Dravecký & Obuch 2009). In pellets from the winter of 2009/2010 in the Turčianska kotlina Basin the common vole *Microtus arvalis* predominated. Sládek (1962) included data from analyses of stomachs of deceased and shot owls predominately in winter periods from four authors: Greschik (1911, 1924), Hrabár (1926), Farský (1928) and Sládek (1961). The results of Hell (1964) from the extreme winter of 1962/63 are also included in this. From the results of these authors it follows that in winter *S. uralensis* hunts predominately in agricultural areas, because non-woodland species, particularly *M. arvalis*, *L. europaeus*, *Passer* spp. and *Corvus* spp. predominate. Greschik (1911) presents results from the Hungarian monarchy, in which small collections from the present-day Hungary, Ukraine and Transylvania in Romania are also included, which, however, in their quantity and species representation correspond with the results from Slovakia from the period from the early 1920s to the 1960s. A special species spectrum is represented by the collections from upper Orava from nest linings of boxes in the vicinity of the hamlet Oravice and the villages Habovka and Vitanová from 1996 through 2012 from the orographic units Západné Tatry Mts., the Podtatranská brázda Trough and the Skorušinské vrchy Mts. Here insectivores (Soricomorpha: *Talpa europaea* and *Sorex araneus*) and rodents (Rodentia: *Microtus agrestis*, *M. subterraneus*, *Arvicola amphibius* and *Sicista betulina*) dominate. The common frog (*Rana temporaria*) is also abundantly represented. For data on the diet of *S. uralensis* from the Malá Fatra Mts. and the Nízke Tatry Mts. of central Slovakia and from the Slanské vrchy Mts. a high abundance of the woodland species *Clethrionomys glareolus* is characteristic. In the orographic units of eastern Slovakia the representation of field mice, especially the species *Apodemus flavicollis* and *A. agrarius*, is more prevalent. In the majority of samples from the Košická kotlina Basin smaller species of songbirds (Passeriformes: *Coccothraustes coccothraustes*, *Turdus merula*, *Fringilla coelebs* and *Parus major*) are more abundant, and in the lowlands of eastern Slovakia *S. uralensis* more often hunts hamsters (*Cricetus cricetus*). The relatively plentiful common dormouse (*Muscardinus avellanarius*, 1.8%) has an equal representation in all of the compared samples of the *S. uralensis* diet from Slovakia, except in pellets from the winter period.

In addition to *S. uralensis* the tawny owl (*Strix aluco*) also breeds in boxes in upper Orava. Obuch (2011) has presented the composition of its dietary spectrum. In Appendix 2 we compare the composition of the diet of *S. uralensis* from four territorial units with the diet of *S. aluco* from the same territory. The results point to the competitive relations of both species in the same time periods. The main difference is in the high share of moles (*T. europaea*) in the diet of *S. uralensis* and the high share of frogs (*Rana temporaria*) and voles (*M. arvalis*, *M. agrestis*) in the diet of *S. aluco*. The breeding season of 2012 is distinguished in *S. uralensis* by a dominant share of woodland species of rodents: *C. glareolus*, *A. flavicollis* and *M. subterraneus*. Based on comparisons of the diets of eight species of owls from the territory of Slovakia (Obuch 2011) the majority of

Tab. 1. Diet of *S. uralensis* found in nests in the mountains of eastern Slovakia
Tab. 1. Potrava *S. uralensis* zistená na hniezdach v pohoriach východného Slovenska

no of. locality / číslo lokality	**1**	**2**	**3**	**Σ**	**%**
taxa / taxón					
Muscardinus avellanarius	3	3		6	4.38
Microtus arvalis	17			17	12.41
Clethrionomys glareolus	14	10		24	17.52
Apodemus agrarius	12			12	8.76
Apodemus flavicollis	20	1	4	25	18.24
Apodemus sylvaticus	8			8	5.84
Apodemus sp.	12			12	8.76
Rattus norvegicus			1	1	0.73
Talpa europaea		1		1	0.73
Mammalia	**86**	**15**	**5**	**106**	**77.37**
Columba livia domestica		1		1	0.73
Columba sp.		1		1	0.73
Streptopelia decaocto	1	1		2	1.46
Cuculus canorus	1	1		2	1.46
Strix uralensis pull.	1			1	0.73
Aegolius funereus		1		1	0.73
Upupa epops	1			1	0.73
Dendrocopos major		1		1	0.73
Picus viridis		1		1	0.73
Garrulus glandarius	1	1		2	1.46
Nucifraga caryocatactes		1		1	0.73
Corvus frugilegus		1		1	0.73
Parus major	1			1	0.73
Sturnus vulgaris	1			1	0.73
Turdus merula	3	1		4	2.92
Turdus philomelos		2		2	1.46
Fringilla coelebs	1			1	0.73
Carduelis chloris	1			1	0.73
Coccothraustes coccothraustes	2		1	3	2.19
Emberiza citrinella	1			1	0.73
Passeriformes indet.	2			2	1.46
Aves	**17**	**13**	**1**	**31**	**22.63**
Σ	**103**	**28**	**6**	**137**	**100.00**

1 – Slanské and Zemplínske vrchy Mts. **2** – Volovské vrchy Mts., Levočské vrchy Mts. and Košická kotlina Basin. **3** – Východoslovenská pahorkatina Hills and Ondavská vrchovina Uplands.

Tab. 2. The diet of *Strix uralensis* found in pellets and nests in Slovakia, own data
Tab. 2. Potrava *Strix uralensis* zistená vo vývržkoch a hniezdnych výstielkach na Slovensku, vlastné údaje

no. of locality / číslo lokality **taxa / taxón**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**Σ**
Erinaceus concolor		1										1
Talpa europaea		18	1		1		5	1	1	47		74
Sorex araneus		5		1		1	1	1		49		58
Sorex minutus		1								2		3
Sorex alpinus										4		4
Neomys fodiens										2		2
Crocidura leucodon		1										1
Myotis cf. *mystacinus*										1		1
Myotis myotis		1										1
Glis glis		3					5					8
Dryomys nitedula			2									2
Muscardinus avellanarius	5	9		1			1			9		25
Sicista betulina										8		8
Mus cf. *musculus*		3										3
Micromys minutus	3				6	2						11
Apodemus flavicollis	118	171	4	37	2		2			57		391
Apodemus sylvaticus	10	6	22									38
Apodemus agrarius	23	47		3	6		3					82
Apodemus sp.	8	3					17					28
Rattus norvegicus	3											3
Cricetus cricetus	21	8				1		1				31
Clethrionomys glareolus	11	21	12	63	1		13	3		70		194
Arvicola amphibius									1	15	2	18
Microtus subterraneus	4	8		7	1	1	1			66		88
Microtus arvalis	7	32		10		1	7				220	277
Microtus agrestis						2	3			29		34
Microtus sp.	3											3
Mustela nivalis											1	1
Mammalia	**216**	**338**	**41**	**122**	**17**	**8**	**58**	**6**	**2**	**359**	**223**	**1390**
Scolopax rusticola										1		1
Columba palumbus		1										1
Columba sp.									1			1
Asio otus		1										1
Aegolius funereus										1		1
Dendrocopos major		1								1		2
Dendrocopos syriacus		1										1
Hirundo rustica		1										1
Anthus trivialis		1										1

diagnostic species is more plentiful in the diet of *S. uralensis* together with woodland diagnostic species in *S. aluco*. Only the representation of collared doves *Streptopelia decaocto* is more plentiful, which is associated with the winter diet in Košice (Dravecký & Obuch 2009), and the higher representation of *Apodemus agrarius*, because data on the diet of *S. uralensis* predominate from eastern Slovakia, where this species of rodent has the highest density.

We compare data on the diet of *S. uralensis* in Slovakia in a summary presented in Appendix 1, with data from the literature not only from the surrounding Central European countries (Hungary, Czech Republic, Poland, Slovenia) with similar natural conditions, but also with the Baltic states (Belarus, the Kaliningrad Region, Latvia and Finland) with wetter plains, with mountainous Norway, and with the zoographically different Pribaikalye area and Sikhote-Alin Mts. (Appendix 3). With the exception of data from eastern Latvia, in the other eleven samples the share of mammals is balanced (Mammalia, 88.6%), from which the basic prey of *S. uralensis* are rodents (Rodentia) and shrews (Soricomorpha). To com-

Tab. 2. continuation
Tab. 2. pokračovanie

no. of locality / číslo lokality **taxa / taxón**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**Σ**
Sylvia borin		1										1
Sylvia atricapilla		1										1
Regulus sp.		1										1
Erithacus rubecula		1								1		2
Turdus merula		14	1									15
Turdus torquatus										6		6
Turdus pilaris										2		2
Turdus philomelos		8	1							1		10
Turdus viscivorus		2	1									3
Parus major		9			2							11
Cyanistes caeruleus		2										2
Sitta europaea		2										2
Fringilla coelebs	1	14										15
Carduelis chloris	1											1
Coccothraustes coccothraustes		20	1	1								22
Loxia curvirostra										1		1
Corvus cornix + *frugilegus*		1										1
Passeriformes sp.		1										1
Aves sp.										1		1
Aves	**2**	**83**	**4**	**1**	**2**	**0**	**0**	**0**	**1**	**15**	**0**	**108**
Rana temporaria		1								25		26
Rana cf. *esculenta*		1										1
Amphibia sp.	2											2
Amphibia	**2**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**25**	**0**	**29**
Coleoptera sp.	8	15								6		29
Gryllotalpa gryllotalpa	1											1
Orthoptera sp.	2	5										7
Evertebrata	**11**	**20**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**6**	**0**	**37**
Σ	**231**	**443**	**45**	**123**	**19**	**8**	**58**	**6**	**3**	**405**	**223**	**1564**

Locality / lokalita: 1 – Východoslovenská pahorkatina Hills, Úbrež – Karná, 27. 11. 2003, Pozdišovce, 1. 11. 2006, Vinné, 22. 2. 1975. **2** – Košická kotlina Basin, Myslava, 4. 5. 1974 & 30. 4. 1977, Haniska 4. 4. 1975 & 10. 3. 2002, Košice, 30. 1. 2002, Olšovany, 17. 6. 1975, 14. 2. 2002 & 2. 3. 2002. **3** – Slanské vrchy Mts., Domáška, 6. 5. 2010, leg. Mihók, det. Baundvin. **4** – Slanské vrchy Mts., Ruskov, 1. 2. 1975, Dubník, 28. 9. 2000, Chlmecká dolina, 6. 5. 1974, Skároš, 6. 5. 1974. **5** – Vihorlatské vrchy Mts., Jovsa, 30. 11. 1975, Vyšná Rybnica, 29. 1. 1997. **6** – Bukovské vrchy Mts., Zboj, 15. 5. 1986, leg. Thomka. **7** – Laborecká vrchovina Uplands, Stakčín, 24. 4. 1979, Snina, 5. 4. 1981, oba leg. Pčola, Palota, 27. 5. 1986, leg. Thomka. **8** – Čergov Mts., Sabinov, 6. 1. 2003, leg. Krišovský. **9** – Levočské vrchy, Bijacovce, 25. 3. 1979, leg. Hrtan. **10** – Upper Orava, years 1996 to 2012 (from Appendix 2), leg. Karaska, Hoľma, Michalec. **11** – Turčianska kotlina Basin, Háj, 7. 3. & 10. 3. 2010, leg. P. Šípoš.

pare the share of individual species is difficult, because in several works the assignation of the remains of the diet of *S. uralensis* to higher taxonomic units (order, family, or to genus) predominates. Despite this fact, from blocks of species with significantly higher representation we can deduce that in the countries of Central Europe these species are represented more plentifully: *M. arvalis*, *M. subterraneus*, *A. flavicollis* and *M. avellanarius* (Appendix 3). The species *T. europaea* and *C. glareolus* are also more often hunted in the Baltic countries, where the species *S. araneus*, *M. agrestis*, *M. oeconomus* and *M. rossiameridionalis* have a more dominant representation. The territories of some species stretch from Europe up through Siberia as far as the Far East, e.g. the species *S. betulina* is the most abundant in the diet of *S. uralensis* in Slovakia, in the Kaliningrad Region of the Baltic, but also in the western Pribaikalye, and the species *A. agrarius* in Slovakia and in the Sichote Alin Mts. to the Far East, to where the species *Clethrionomys rufocanus* from Norway also extends.

With the summary of the results it was determined that the primary component of the diet of *S. uralensis*

in Slovakia is small terrestrial mammals (85.75%), particularly the species *Apodemus flavicollis*, *Microtus arvalis*, *Clethrionomys glareolus*, *Microtus subterraneus* and *Apodemus agrarius*, and to a smaller measure birds (9.75%), from the species of the genus *Turdus*, *Coccothraustes coccothraustes* and *Fringilla coelebs*. Invertebrates make up a small component (2.95%) as do amphibians, reptiles and fish (1.55%); in these groups frogs from the genus *Rana* predominate.

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Appendix 1

Differences in quantitative representation of species from data on the diet of *S. uralensis* in Slovakia. H' – diversity index

Rozdiely v kvantitatívnom zastúpení druhov z údajov o potrave *S. uralensis* na Slovensku. H' – index diverzity

Samples / vzorky	**9**	**11**	**10**	**8**	**6**	**7**	**4**	**5**	**1**	**2**	**3**	**Σ**	**%**
taxa / taxón													
Streptopelia decaocto	3+ 23			1- 0			2			1- 0		25	1.17
Microtus arvalis	1- 0	3+ 220	1+ 94	5- 0	2- 4	1- 0	1- 17	1- 10	2- 7	1- 32	1- 8	392	18.37
Lepus europaeus			1+ 9									9	0.42
Sciurus vulgaris			1+ 10									10	0.47
Passer domesticus			1+ 7									7	0.33
Passer montanus			1+ 5									5	0.23
Corvus cornix + frugilegus			1+ 6				1			1		8	0.37
Coleoptera sp.		1- 0	1+ 17	6					8	15		46	2.16
Orthoptera sp.			1+ 9						2	5		16	0.75
Talpa europaea		2- 0	6	2+ 47		4	1- 1	1- 1	2- 0	18	8	85	3.98
Sorex araneus		1- 0	14	2+ 49	2		1- 0	1- 1	2- 0	1- 5	3	74	3.47
Microtus subterraneus		2- 0	1- 3	2+ 66	9	1	1- 0	7	1- 4	1- 8	3	101	4.73
Microtus agrestis			1	2+ 29		1				1- 0	5	36	1.69
Rana temporaria				2+ 25						1- 1		26	1.22
Sicista betulina				1+ 8								8	0.37
Arvicola amphibius		2	3	1+ 15						1- 0	1	21	0.98
Turdus torquatus				1+ 6								6	0.28
Clethrionomys glareolus	1- 0	4- 0	1- 12	70	2+ 56	1+ 12	1+ 33	2+ 75	1- 11	2- 21	17	307	14.39
Apodemus sylvaticus		1- 0	1- 0	2- 0			8	2+ 22	1+ 10	6		46	2.16
Cricetus cricetus				1- 0					2+ 21	8	3	32	1.5
Apodemus flavicollis	1- 0	4- 0	2- 17	1- 57	19	8	31	41	1+ 118	1+ 171	2- 4	466	21.84
Apodemus agrarius		2- 0	11	3- 0	1- 0		12	1- 3	1+ 23	1+ 47	9	105	4.92
Turdus merula	1						4	1		1+ 14		20	0.94
Turdus philomelos				1			3	1		1+ 8		13	0.61
Parus major							1			1+ 9	2	12	0.56
Fringilla coelebs				3			1		1	1+ 14		19	0.89
Coccothraustes coccothr.				1- 0			3	2		1+ 20		25	1.17
Glis glis										3	1+ 5	8	0.37
Micromys minutus									3		2+ 11	14	0.66
Muscardinus avellanarius		1- 0	3	9	1	4	6	1	5	9	1	39	1.83
Rattus norvegicus			3				1		3			7	0.33
Columba livia dom.	4		1				1					6	0.28
Mustela nivalis		1	4									5	0.23
Turdus viscivorus					1	1		1		2		5	0.23
Mammalia	**3- 0**	**223**	**194**	**359**	**91**	**30**	**121**	**163**	**216**	**338**	**95**	**1830**	**85.75**
Aves	**2+ 30**	**3- 0**	**26**	**1- 15**	**7**	**3**	**1+ 34**	**1- 5**	**2- 2**	**1+ 83**	**1- 3**	**208**	**9.75**
Amphibia, Reptilia, Pisces	**0**	**0**	**4**	**2+ 25**	**0**	**0**	**0**	**0**	**2**	**1- 2**	**0**	**33**	**1.55**
Evertebrata	**0**	**1- 0**	**2+ 26**	**1- 6**	**0**	**0**	**1- 0**	**1- 0**	**11**	**1+ 20**	**0**	**63**	**2.95**
Σ	**30**	**223**	**250**	**405**	**98**	**33**	**155**	**168**	**231**	**443**	**98**	**2134**	**100**
H'	0.81	0.08	2.52	2.39	1.39	1.75	2.62	1.63	1.89	2.5	2.46	2.84	

Appendix 1
continuation / pokračovanie

Samples / vzorky: **9** – Košice, Dravecký & Obuch 2009. **11** – Turiec, Háj, winter 2009/2010. **10** – Slovakia, stomachs, Sládek 1962, Hell 1964. **8** – Orava, Oravice. **6** – Nízke Tatry, Selce, Adamec et al. 2003. **7** – Malá Fatra Mts., Vrícke sedlo Saddle, Šotnár 2005. **4** – East Slovakia, stores in a nest, own data and Bauer & Tichý 1960. **5** – Slanské vrchy Mts. **1** – Východoslovenská pahorkatina Hills. **2** – Košická kotlina Basin. **3** – north-eastern Slovakia, Vihorlatské vrchy Mts., Bukovské vrchy Mts., Laborecká vrchovina Uplands, Čergov Mts., Levočské vrchy Mts.
Other species (**sample**–number) / Ostatné druhy (**vzorka**–počet): *Erinaceus concolor* (**2**–1), *Sorex minutus* (**8**–2; **2**–1), *Sorex alpinus* (**8**–4), *Neomys fodiens* (**10**–1; **8**–2), *Crocidura leucodon* (**2**–1), *Crocidura* sp. (**10**–3), *Myotis* cf. *mystacinus* (**8**–1), *Myotis myotis* (**2**–1), *Dryomys nitedula* (**5**–2), *Mus* cf. *musculus* (**2**–3), *Apodemus* sp. (**4**–12; **1**–8; **2**–3; **3**–17), *Microtus* sp. (**1**–3), *Perdix perdix* (**10**–1), *Scolopax rusticola* (**8**–1), *Columba palumbus* (**2**–1), *Columba* sp. (**4**–1; **3**–1), *Cuculus canorus* (**4**–2), *Asio otus* (**2**–1), *Aegolius funereus* (**8**–1; **7**–1; **4**–1), *Strix aluco* (**10**–1), *Strix uralensis* (**4**–1), *Upupa epops* (**4**–2), *Picus viridis* (**4**–1), *Dendrocopos major* (**8**–1; **4**–1; **2**–1), *Dendrocopos syriacus* (**2**–1), *Hirundo rustica* (**2**–1), *Anthus trivialis* (**2**–1), *Sylvia borin* (**2**–1), *Sylvia atricapilla* (**2**–1), *Regulus* sp. (**2**–1), *Erithacus rubecula* (**8**–1; **2**–1), *Turdus pilaris* (**8**–2), *Turdus* sp. (**4**–1), *Cyanistes caeruleus* (**2**–2), *Sitta europaea* (**2**–2), *Emberiza citrinella* (**4**–1), *Carduelis cannabina* (**6**–2), *Carduelis chloris* (**9**–1; **6**–1; **4**–1; **1**–1), *Pyrrhula pyrrhula* (**7**–1), *Loxia curvirostra* (**8**–1), Fringillidae sp. (**10**–1), *Sturnus vulgaris* (**4**–1), *Garrulus glandarius* (**10**–1; **4**–2), *Nucifraga caryocatactes* (**4**–1), *Pica pica* (**10**–1), Passeriformes sp. (**9**–1; **4**–2; **2**–1), Aves sp. (**10**–2; **8**–1), *Rana* cf. *esculenta* (**2**–1), *Rana* sp. (**10**–4), Amphibia sp. (**1**–2), *Gryllotalpa gryllotalpa* (**1**–1)

Appendix 2
Upper Orava, comparing the diet of *S. uralensis* with the diet of *S. aluco*
Horná Orava, porovnanie potravy *S. uralensis* s potravou *S. aluco*

Localities / lokality	**3**	**2**	**4**	**1**	**5**	**Σ**	**%**
Taxa / taxóny	*Strix uralensis*			*Strix aluco*			
Talpa europaea	3	1+ 8	1+ 12	1+ 24	2- 8	55	5.47
Sorex araneus	6	1	12	1+ 30	1- 36	85	8.45
Apodemus flavicollis		1	1- 3	1+ 53	1- 47	104	10.34
Clethrionomys glareolus	2	1- 0	9	1+ 59	66	136	13.52
Microtus subterraneus	2	7	13	1+ 44	1- 44	110	10.93
Microtus agrestis	8	2	17	3- 2	1+ 110	139	13.82
Microtus arvalis				1- 0	1+ 25	25	2.49
Rana temporaria	3	2	16	2- 4	1+ 112	137	13.62
Arvicola amphibius	4	3	7	1- 1	20	35	3.48
Muscardinus avellanarius	1	1	4	1- 3	28	37	3.68
Sicista betulina			6	1- 2	24	32	3.18
Turdus philomelos			1		13	14	1.39
Neomys fodiens		1	1		10	12	1.19
Sorex minutus				2	9	11	1.09
Coleoptera sp.			2	4	5	11	1.09
Turdus torquatus				6	2	8	0.8
Mus musculus					7	7	0.7
Sorex alpinus		2	1	1	2	6	0.6
Mammalia	**26**	**26**	**85**	**222**	**442**	**801**	**79.62**
Aves	**1**	**2**	**3**	**9**	**38**	**53**	**5.27**
Amphibia	**3**	**2**	**16**	**2- 4**	**1+ 113**	**138**	**13.72**
Evertebrata	**0**	**0**	**2**	**4**	**8**	**14**	**1.39**
Σ	**30**	**30**	**106**	**239**	**601**	**1006**	**100**
H'	1.99	2.1	2.4	2.02	2.67	2.68	

Samples / vzorky: **3** – Vitanová, Gabarová, years 2001 and 2002. **2** – Habovka, Zamaňová, 2002. **4** – Oravice, 1996, 1998 and 2000. **1** – Osobitá, sedlo Borek Saddle. **5** – diet of *S. aluco*, Obuch (2011).

Appendix 3

A comparison of the diet of *S. uralensis* from different countries / Porovnanie potravy *S. uralensis* z rôznych krajín

Country / štát	SLO		SK		H		CZ		PL		RUS		BY		LV		FIN		N		RUS		RUS			
Localities / lokality	2		1		4		3		5		7		6		8		9		10		12		11		Σ	%
Taxa / taxón																										
Neomys anomalus	3+	23															2-	0							23	0.12
Microtus arvalis	2+	32	3+	392	1+	144	2+	63	1-	7	1-	1	4-	0	4-	0	7-	0	1-	0	5-	0	1-	0	639	3.39
Microtus subterraneus	1+	9	3+	101	1-	8	2+	31					2-	0	2-	0	4-	0			2-	0			149	0.79
Micromys minutus	3+	22	1+	14	1-	2					2		1-	0		1	1-	13				9			63	0.33
Lepus europaeus			1+	9				1			1						1-	0							11	0.06
Apodemus sylvaticus		1	3+	46	1-	2											3-	0			1-	0			49	0.26
Cricetus cricetus			2+	32	1-	0											2-	0							32	0.17
Streptopelia decaocto			2+	25													2-	0							25	0.13
Columba livia dom.			1+	6		1																			7	0.04
Turdus torquatus			1+	6																					6	0.03
Parus major			1+	12		4				3							2-	0						3	22	0.12
Passer domesticus			1+	7																					7	0.04
Passer montanus			1+	5				1																	6	0.03
Corvus cornix + frugilegus			1+	8																					8	0.04
Orthoptera sp.			2+	16													1-	0				1			17	0.09
Apodemus agrarius			3+	105	2-	4							2-	0	2-	0	4-	0			1+	35			144	0.76
Sicista betulina			1+	8							1+	5					2-	0					2+	13	26	0.14
Rana temporaria			2+	26	1-	0					2+	10					2-	0							36	0.19
Coleoptera sp.			1+	46	2+	103					2+	13	2-	0	2-	0	5-	0			3-	0			162	0.86
Talpa europaea		7	1+	85	1+	173	1+	26	1-	6		1	1+	65	2+	166	6-	0	1-	0	4-	0			529	2.81
Turdus merula			1+	20	1+	22	1+	8					1-	0	1+	11	3-	0		1	1-	0			62	0.33
Turdus philomelos			1+	13	1+	11		2				1			2+	16	3-	0			1-	0			43	0.23
Apodemus flavicollis	1-	0	3+	466		74	1+	24	1-	3		3	4-	0	4-	0	6-	0	1-	0	4-	0			570	3.03
Glis glis			1+	8	2+	18											2-	0							26	0.14
Muscardinus avellanarius			2+	39	2+	41							1-	0	1-	0	4-	0			2-	0			80	0.42
Fringilla coelebs			1+	19	1+	21				5						5	3-	0		1	1-	0			51	0.27
Coccothraustes coccothr.			2+	25	1+	24				1							3-	0			1-	0			50	0.27
Clethrionomys glareolus	2-	5		307	1+	541		68	1+	79		18	2+	474	1-	85	1-	721		15	6-	0	2-	0	2313	12.28
Dryomys nitedula				2	2+	29											2-	0							31	0.16
Apodemus sp.		14	2-	40	3+	1157	4-	0	1-	14	2-	0	5-	0	3-	16	8-	0	2-	0		124	2-	0	1365	7.25
Sturnus vulgaris				1	1+	7																			8	0.04
Garrulus glandarius		1		3	1+	12		3		4		1				6	2-	0		1					31	0.16
Sorex araneus		10		74	1-	44	2+	79	1+	31	1-	0	4-	0	1+	91	1+	456	1+	19	5-	0	1-	0	804	4.27
Microtus agrestis	1+	28	3-	36	7-	0	1+	96	2+	179	1+	41	6-	0	1+	321	1+	1176	2+	50	6-	0	2-	0	1927	10.23
Dendrocopos major				3		4		2	1+	5						5	2-	0		2					21	0.11
Microtus oeconomus			1-	0	1-	0					4+	53	1-	0			3-	0			1-	0			53	0.28
Sorex sp.			1-	0	2-	0					2+	12	1-	0	1-	0	3-	0			3+	58			70	0.37
Soricidae sp.	1+	6	2-	0	2-	0							3+	103	2-	0	4-	0			2-	0			109	0.58
Muridae sp.			2-	0	2-	0						2	3+	78	1-	0	4-	0				4			84	0.45
Reptilia sp.													2+	10			1-	0							10	0.05
Microtus sp.		6	3-	3	5-	0	2-	0		11		1	3+	416	1+	83	6-	0	1-	0	4-	0			520	2.76
Rodentia sp.			1-	0	2-	0							2+	32	1+	14	3-	0	1+	7	1+	16			69	0.37
Amphibia sp.			2-	2	2-	4							1+	27	3+	122	5-	0			3-	0			155	0.82
Insecta sp.		5	3-	0	3-	0	1-	0		8			2+	67	3+	106	5-	0			3-	0			186	0.99
Dryocopus martius						2									1+	5									7	0.04
Columba palumbus				1				3		3					1+	7	1-	0							14	0.07

Appendix 3
continuation / pokračovanie

Country / štát	SLO		SK		H		CZ		PL		RUS		BY		LV		FIN		N		RUS		RUS			
Localities / lokality	**2**		**1**		**4**		**3**		**5**		**7**		**6**		**8**		**9**		**10**		**12**		**11**		**Σ**	**%**
Taxa / taxón																										
Turdus sp.			1-	1	1-	1			1+	7			1-	0	3+	51	3-	0		2		12		2	76	0.40
Microtus rossiaemeridionalis			3-	0	3-	0	1-	0					2-	0	3+	110	1-	50			3-	0	2+	20	180	0.96
Sorex minutus				3		11		5		5			1-	0	1-	0	1+	34		1	1-	0			59	0.31
Sorex caecutiens																	1+	25				3			28	0.15
Neomys fodiens		1		3	1-	0		1				2					1+	42			1-	0			49	0.26
Leporidae sp.			3-	0	3-	0								10	1-	3	1+	130			2-	0			143	0.76
Sciurus vulgaris				10	2-	0		1		1		1		10		4	1+	74		1	2-	1			103	0.55
Mus cf. *musculus*		1		3		6										2	1+	31			1-	0		2	45	0.24
Rattus norvegicus				7	2-	1							1-	0	1-	1	1+	72		2	2-	0			83	0.44
Arvicola amphibius	1-	5	3-	21	5-	3	1-	20	1-	11	2-	1		110	4-	7	1+	1328	1-	2	6-	0	2-	0	1508	8.01
Arvicolidae sp.	3-	0	7-	0	7-	0	5-	0	5-	0	3-	0	6-	0	6-	0	1+	3016	3-	0	7-	0	3-	0	3016	16.02
Mustela nivalis		1		5	1-	0								5		4	1+	29		1	1-	0			45	0.24
Galliformes sp.			1-	0	1-	0											1+	41			1-	0			41	0.22
Fringillidae sp.			3-	1	3-	0	1-	0	1-	0			2-	0		14	1+	174			3-	0			189	1.00
Rana sp.		3	3-	4	4-	1	1-	2	1+	17			3-	0	3-	0	1+	284			1-	25			336	1.78
Corvidae sp. juv.																	1+	22							22	0.12
Clethrionomys rufocanus	2-	0	5-	0	6-	0	3-	0	3-	0	2-	0	5-	0	5-	0	7-	0	1+	22	3+	1059	1-	0	1081	5.74
Mogera robusta																	1-	0			2+	17			17	0.09
Sorex isodon																					1+	5			5	0.03
Sorex gracillimus																	1-	0			2+	11			11	0.06
Sorex unguiculatus																					1+	5			5	0.03
Pteromys volans			2-	0	2-	0							1-	0	1-	0	1-	21			3+	56			77	0.41
Apodemus peninsulae			2-	0	2-	0							2-	0	2-	0	4-	0			3+	117			117	0.62
Clethrionomys rutilus			1-	0	1-	0							1-	0	1-	0	3-	0			3+	59			59	0.31
Clethrionomys sp.					1-	0											2-	0		3	2+	27			30	0.16
Microtus fortis			3-	0	3-	0	1-	0	1-	0			2-	0	2-	0	5-	0			3+	203			203	1.08
Parus sp.																	1-	0			2+	13			13	0.07
Sitta europaea			1-	2	2-	0							1-	0	1-	0	3-	0			3+	65			67	0.36
Sorex roboratus																	1-	0					2+	14	14	0.07
Cricetulus barabensis																	1-	0					3+	17	17	0.09
Microtus gregalis			1-	0	1-	0											3-	0			1-	0	4+	46	46	0.24
Turdus viscivorus				5		3		3									1-	0							11	0.06
Sorex minutissimus																		11				1		3	15	0.08
Columba sp.				2												4		5							11	0.06
Mammalia		**174**		**1830**		**2267**		**416**		**347**		**144**		**1306**		**908**		**7240**		**125**		**1817**		**115**	**16689**	**88.62**
Aves	**1-**	**3**	**1+**	**208**		**152**		**38**	**1+**	**40**		**8**	**1-**	**52**	**2+**	**249**	**1-**	**341**	**1+**	**23**		**115**		**7**	**1236**	**6.56**
Amphibia. Reptilia. Pisces		**3**	**1-**	**33**	**3-**	**5**	**2-**	**2**		**17**	**1+**	**11**		**37**	**2+**	**122**	**1+**	**285**	**1-**	**0**	**1-**	**26**		**0**	**541**	**2.87**
Evertebrata		**5**	**1+**	**63**	**1+**	**103**	**2-**	**0**		**8**	**1+**	**13**	**1+**	**67**	**2+**	**106**	**6-**	**0**		**0**	**3-**	**1**		**0**	**366**	**1.94**
Σ		**185**		**2134**		**2527**		**456**		**412**		**176**		**1462**		**1385**		**7866**		**148**		**1959**		**122**	**18832**	**100**
H'		2.57		2.84		1.96		2.38		2.09		2.2		1.95		2.63		2.01		2.33		1.89		1.82	3.22	

Location / lokality: 2 – Slovenia, Ljubljansko barje, Vrezec 2001. 1 – Slovakia, own data and data from the literature. 4 – Hungary, Zemplínske vrchy Mts., Jánossy et al. 1992, Petrovics 2007. 3 – Czech Republic, Šumava Mts., Kloubec et al. 2005. 5 – Poland, Niepolomický forest, Czuchnowski 1997. 7 – East Prussia (today's Gvardeysk, Russia, Kaliningrad Region), Tapiau, Uttendörfer 1939. 6 – Belarus, Gorodok and Polotsk, Sidorovich et al. 2003. 8 – East Latvia, collections from 1989 and 2004, Avotins A. jr. in litt. 9 – Finland, Korpimäki & Sulkava 1987. 10 – Norway, Mysterud & Hagen 1969. 12 – Russia, south of Sichote-Alin Mts., Shokhrin 2009. 11 – Russian, West Pribajkalje, River Kamenka, Ryabtsev & Rezin 2009.

Slovak Raptor Journal 2013, 7: 59–71. 10.2478/srj-2013-0003.