

DIET OF THE RED-BACKED SHRIKE *Lanius collurio* IN BULGARIAPrehrana rjavega srakoperja *Lanius collurio* v Bolgariji

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The diet of the Red-backed Shrike *Lanius collurio* was studied from pellets and food remains collected beneath perches, as well as from food samples obtained from nestlings, using neck collars, during the breeding season (May - July), in 1995 - 1997. The following parameters of 23 pellets were established (mm): 17.4 x 7.7 (12.0 - 27.7 x 6.5 - 9.0). A total of 377 prey items belonging to 59 taxa were found. Invertebrates were represented mainly by insects Insecta (94.72 %). Spiders Aranea were also identified (3.4 %), harvestmen Opiliones (0.80 %), worms Lumbricomorpha, snails Gastropoda and millipedes Juliformia, 0.27 % each. Vertebrates (Common Vole *Microtus arvalis*) comprised 0.27 % of total prey. The most varied elements of the prey were beetles Coleoptera (41.11 % of all prey items): at least 11 families were established. Almost half the beetles (48 %) were Scarabaeidae and Carabidae species. In comparison with adult birds, soft and non-sclerotized prey predominated in the nestlings' diet: Aranea (6.8 versus 3.6 %), Lepidoptera caterpillars (5.8 vs. 1.8 %), Opiliones (1.9 vs. 0 %), and Lumbricomorpha (1.0 vs. 0 %). The results for the adults diet could be underestimated, while it is difficult to identify the above-mentioned organisms in the remains in pellets. Some taxa were found only in the nestlings' food: Opiliones, Juliformia, Lumbricomorpha and, surprisingly, rodents Rodentia. Remains of Gastropoda were found only in adults' diet.

**Key words:** Red-backed Shrike, *Lanius collurio*, food spectrum, Bulgaria

**Ključne besede:** rjavi srakoper, *Lanius collurio*, prehrana, Bolgarija

## 1. Introduction

The diet of the Red-backed Shrike *Lanius collurio* is comparatively well studied throughout most parts of its breeding range (see compilation in CRAMP & PERRINS 1993). As an opportunistic feeder this species preys mainly on insects and other invertebrates. However, small vertebrates can sometimes play an important role in its food spectrum (CRAMP & PERRINS 1993).

In Bulgaria there are very few data on the food of Red-backed Shrike. The information is based mostly on analysis of stomach contents (TALEV 1962, PROSTOV 1964, SIMEONOV & BOGDANOV 1967, DARAKTCHIEV & GERMANOV 1974, DARAKTCHIEV 1981). Today, collecting birds just to study their food is not acceptable, especially as the Red-backed Shrike

population is declining in Europe (TUCKER *et al.* 1994). Using only the method of stomach analysis also makes it difficult to identify soft and poorly chitinized invertebrates. Pellet analysis is the best method, in spite of the considerable effort required to identify prey, but the use of other methods (identification of stored prey and prey remains collected under perches, as well as collar-sample analysis) provides complementary information (HERNÁNDEZ 1999). This complex study of Red-backed Shrike diet was undertaken with the purpose of trying to clarify the food spectrum of this species in Bulgaria.

## 2. Material and methods

A total of 377 prey items (mainly invertebrates) were established in the food of Red-backed Shrike by

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analysis of pellets (93.4 %), food remains collected beneath perches (1.3 %) and collar-samples (5.3 %). Caching food takes place rarely among this species in Bulgaria (only fragmentary data exist), at least in the lower parts of the country (NIKOLOV unpubl.) and, for that reason, stored prey analysis has been excluded from this work. The data for the present study was collected during May to July for 3 years (1995 – 1997). Field work was carried out for 117 days. Two localities in the Sofia region, W. Bulgaria, were investigated – Pasarel (a village on the Iskar river, about 30 km SE of Sofia) and the Kambanite area (close to the SE outskirts of Sofia, just outside the ring-road). Additional data were collected from Yablanitsa (Lovech region, N Bulgaria). These three study areas are characterized by moderate continental climate and low mountain (900 m a.s.l.), kettle-like (590 m a.s.l.) and hilly relief (450 m a.s.l.) respectively.

The adult Red-backed Shrike pellets and food remains were collected beneath perches. Pellets of nestlings were collected during regular nest examinations. The collar-samples were obtained using neck rings and methods after MALCHEVSKIY & KADOCHNIKOV (1953) and KOULIGIN (1981).

All pellets, food samples and prey remains were preserved in 75 % ethanol and subsequently analysed. The minimum number of individuals of prey per taxon was estimated for every pellet.

### 3. Results and discussion

#### 3.1. Pellets

Out of 34 intact pellets collected, the average measurements of 23 were 17.4 x 7.7 mm (12.0 – 27.7 x 6.5 - 9.0). They were oblong in shape and generally straight, with one of the ends sharply pointed. Usually the adult shrike pellets were glossy black and smooth, while most of the nestling ones were brown. Size difference between the pellets of adults and nestlings was not established.

These dimensions are similar to those given by HERNÁNDEZ (1995) for 505 pellets from Spain: 19.6 x 8.44 mm. MIELEWCZYK (1967) in Poland also obtained similar results (N = 12): 25 x 8.5 mm.

#### 3.2. Food spectrum

A total of 377 prey items belonging to 59 taxa were identified in the composition of Red-backed Shrike diet, among them 1 class, 10 orders, 4 suborders, 2 superfamilies, 15 families, 1 subfamily, 20 genera and 6 species (Table 1).

**Table 1:** Diet of the Red-backed Shrike *Lanius collurio* during the breeding season in Bulgaria

**Tabela 1:** Prehrana rjavega srakoperja *Lanius collurio* v gnezditvenem obdobju v Bolgariji

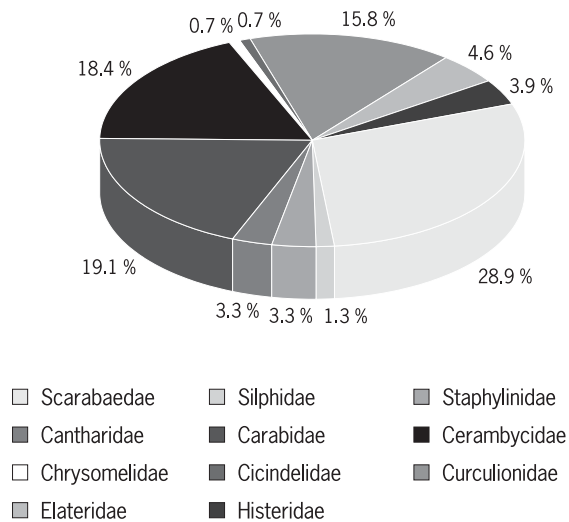
Prey items/ Enote plena	Sofia region		Yablanitsa	
	N	N	N	%
Lumbricomorpha				
<i>Lumbricus terrestris</i>	1		1	0.26
Gastropoda g. sp.	1		1	0.26
Opiliones g. sp.	1	1	2	0.53
<i>Zachelus crista</i>	1		1	0.26
Aranea g. sp.	8		8	2.12
Araneidae g. sp.	1		1	0.26
<i>Araneus</i> sp.	1		1	0.26
Lycosidae g. sp.	3		3	0.79
Diplopoda				
Juliformia g. sp.	1		1	0.26
Orthoptera g. sp.	24	3	27	7.16
<i>Gryllus</i> sp.	3		3	0.79
<i>Gryllus campestris</i>	2		2	0.53
Acridoidea g. sp.	1		1	0.26
Tettigonoidea g. sp.	1		1	0.26
Dermaptera g. sp.		1	1	0.26
Homoptera				
Cicadinea g. sp.		1	1	0.26
Heteroptera g. sp.	8	1	9	2.39
<i>Aelia</i> sp.	1	1	2	0.53
<i>Palomena</i> sp.	3		3	0.79
<i>Rhinocoris</i> sp.	1		1	0.26
Coleoptera g. sp.	3		3	0.79
Cantharidae				
<i>Cantharis</i> sp.	5		5	1.33
Carabidae g. sp.	23	6	29	7.69
Cerambycidae g. sp.	8		8	2.12
<i>Chytus</i> sp.	1		1	0.26
<i>Dorcadion</i> sp.	18	1	19	5.04
Chrysomelidae g. sp.	1		1	0.26
Cicindelidae				
<i>Cicindela</i> sp.	1		1	0.26
Curculionidae g. sp.	19		19	5.04
<i>Otiorrhynchus</i> sp.	5		5	1.33
Elateridae g. sp.	6	1	7	1.86
Histeridae g. sp.	3		3	0.79
<i>Atholius</i> sp.		1	1	0.26
<i>Hister</i> sp.	2		2	0.53
Scarabaeidae g. sp.	3	1	4	1.06

nadaljevanje tabele 1 / continuation of Table 1

Prey items/ Enote plena	Sofia region	Yabla- nitsa	Total/ Skupaj	
	N	N	N	%
<i>Amphimallon</i> sp.	4		4	1.06
<i>Anisoplia</i> sp.	1		1	0.26
<i>Aphodius</i> sp.	2	2	4	1.06
<i>Caccobius</i> sp.	1		1	0.26
<i>Onthophagus</i> sp.	11	1	12	3.18
Rhizotroginae g. sp.	17	1	18	4.77
Silphidae g. sp.		2	2	0.53
Staphylinidae g. sp.		1	1	0.26
<i>Pseudocypus</i> sp.	1		1	0.26
<i>Staphylinus</i> sp.	1		1	0.26
<i>Staphylinus caesarus</i>	2		2	0.53
Hymenoptera g. sp.	9	6	15	3.98
Formicidae g. sp.	52	37	89	23.61
<i>Formica polyctena</i>	1		1	0.26
Apoidea g. sp.	13	3	16	4.24
<i>Bombus</i> sp.	4	3	7	1.86
Vespoidea g. sp.	1		1	0.26
Vespidae g. sp.	2		2	0.53
Lepidoptera g. sp.	4		4	1.06
Geometridae g. sp.	1		1	0.26
NonGeometridae g. sp.	4		4	1.06
Diptera g. sp.	1		1	0.26
Nematocera g. sp.	10		10	2.65
Rodentia				
<i>Microtus arvalis</i>	1		1	0.26
Total / Skupaj	303	74	377	100

The proportion, by numbers, of invertebrates and vertebrates in food was 99.73 : 0.27 % (Figure 1). The most frequent prey were various species of beetles (mostly Scarabaeidae, Carabidae, Cerambycidae and Curculionidae), hymenopterans (Formicidae mainly) and Orthoptera species (crickets and grasshoppers), forming together almost 85 % of all prey items. The share of the remaining orders in the diet of Red-backed Shrike ranged between 0.27 and 3.98 %.

Figure 2 shows the number of families in every main taxon represented in the diet of this species. Except for Coleoptera, all other groups were represented by 1 to 3 families. Beetles were the most diverse group - at least 11 families were established, comprising 41.11 % of all prey items. Almost half (48 %) were Scarabaeidae and Carabidae species (Figure 3); long-horned Cerambycidae and snout beetles Curculionidae played a considerable role as well. The participation of 7 other beetle families was minor (1.3 - 4.6 %).



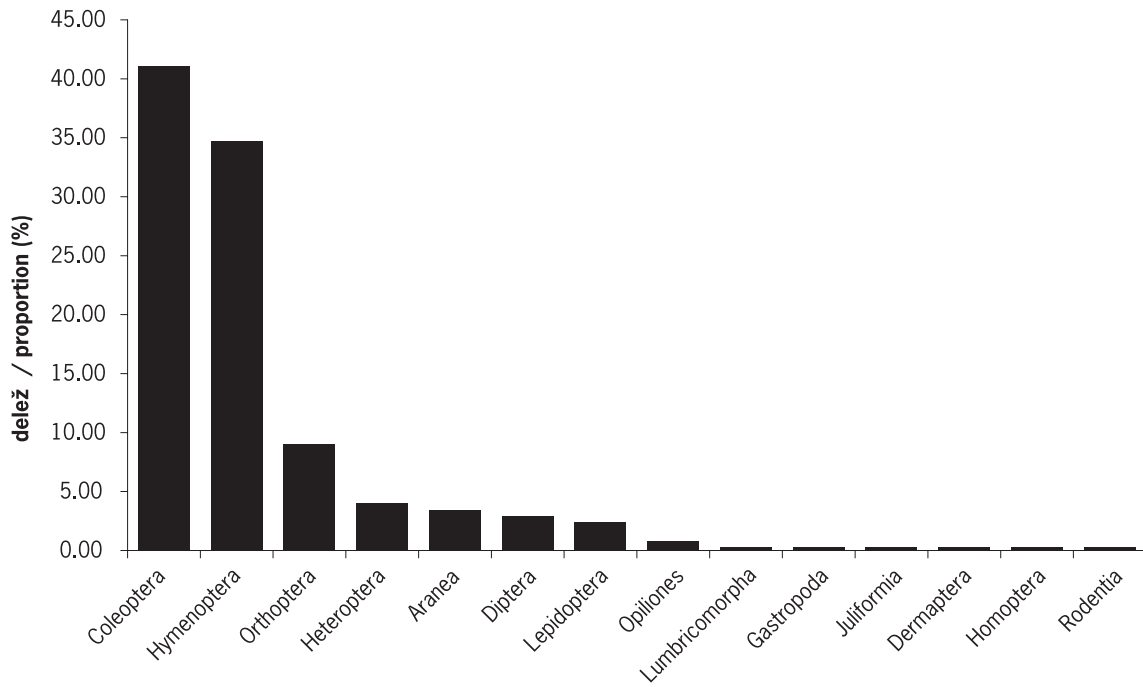
**Figure 3:** Proportion of the beetle Coleoptera families (N = 153 prey items) in the diet of the Red-backed Shrike *Lanius collurio* in Bulgaria

**Slika 3:** Delež družin hroščev Coleoptera (N = 153 enot plena) v prehrani rjavega srakoperja *Lanius collurio* v Bolgariji

The food of adults and nestlings was compared on the basis of the material collected in the Sofia region - 303 prey items (Figure 4). In both cases Coleoptera represented about half of the prey. In the adults' diet, hymenopterans were ranked as second. Their large number was due mainly to the ants, which are rather unprofitable for feeding the nestlings, from a nutritional and bioenergetical point of view. In the food of the youngsters in the nests the hymenopterans were fewer than orthopterans and they were represented mainly by bees Apoidea (mostly *Bombus* sp.) and wasps Vespoidea.

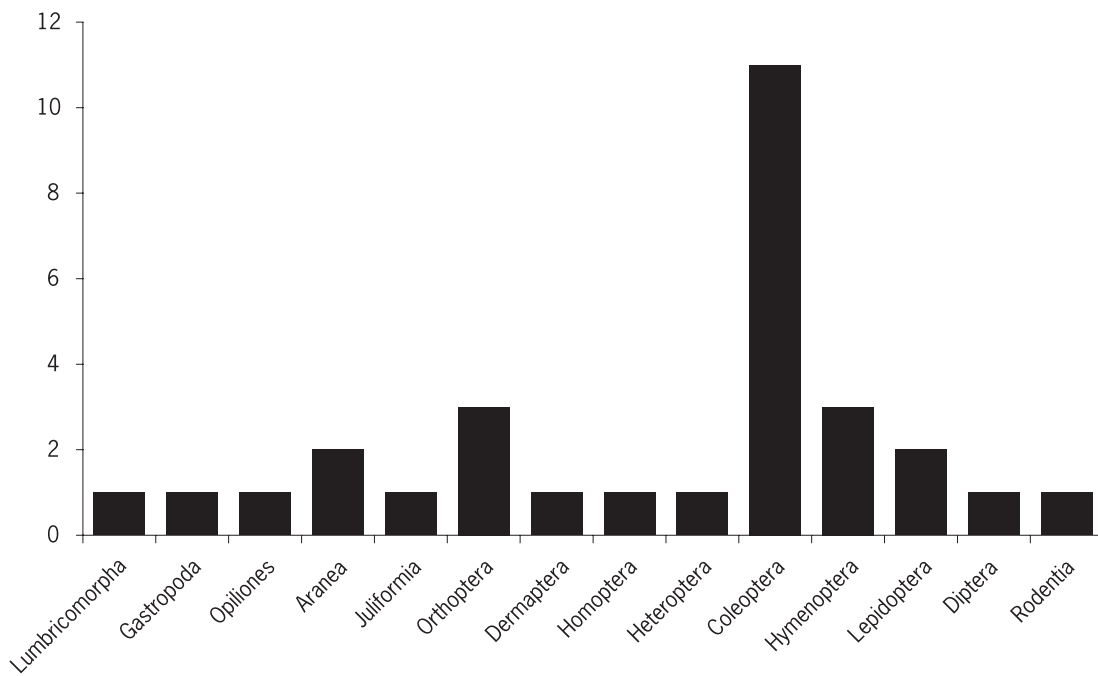
Soft and non-sclerotized invertebrates (Aranea, Lepidoptera caterpillars, Opiliones, and Lumbricomorpha) predominated 2 to 3 fold in nestling versus adult bird diet. Due to the difficulty of identifying the above mentioned organisms from remains in pellets, it is possible that the results for the adults have been, to some extent, underestimated.

Opiliones, Juliformia, Lumbricomorpha and, surprisingly, Rodentia were established among the food of nestlings alone. Remains (teeth) of Common Vole *Microtus arvalis* were found in a pellet close to the village of Pasarel. That confirms the data for Red-backed Shrike diet in Lozen mountain (SIMEONOV & BOGDANOV 1967). Remains of Gastropoda shell were identified only in adult diet; single cases have been

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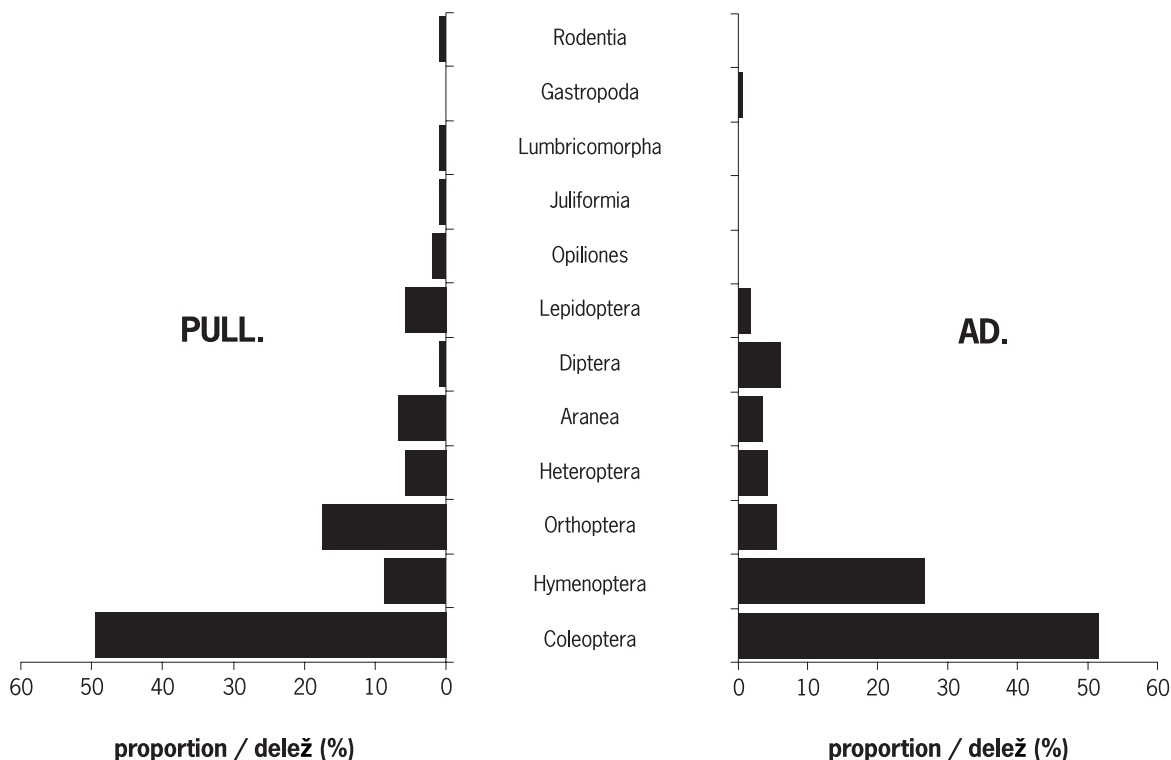
**Figure 1:** Prey proportion in the diet of the Redbacked Shrike *Lanius collurio* in Bulgaria (N = 377 prey items)

**Slika 1:** Deleži plena v prehrani rjavega srakoperja *Lanius collurio* v Bolgariji (N = 377 enot plena)



**Figure 2:** Number of families per main taxon, taking part in the food composition of the Red-backed Shrike *Lanius collurio* in Bulgaria (N = 377 prey items)

**Slika 2:** Število družin v posameznih višjih taksonih, najdenih v prehrani rjavega srakoperja *Lanius collurio* v Bolgariji (N = 377 enot plena)



**Figure 4:** Comparison between the food of nestlings (N = 134 prey items, left side) and adults (N = 169 prey items, right side) of the Red-backed Shrike *Lanius collurio* in Sofia region, W Bulgaria

**Slika 4:** Primerjava med prehrano mladičev (N = 134 enot plena, leva stran) in odraslih ptic (N = 169 enot plena, desna stran) rjavega srakoperja *Lanius collurio* v sofijski regiji, Z Bolgarija

described of specialized individuals eating these mollusks (LACHNER 1958).

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#### 4. Povzetek

Avtor je v letih 1995–1997 preučeval prehrano rjavega srakoperja *Lanius collurio* iz izbljuvkov in ostankov hrane, najdene pod srakoperjevimi počivališči, in

primerkov hrane, dobljenih od srakoperjevih gnezdomcev z uporabo ovratnikov med gnezditvenim obdobjem (maj-julij). Pri 23 izbljuvkah so bili ugotovljeni naslednji parametri (mm): 17,4 x 7,7 (12,0 – 27,7 x 6,5 – 9,0). Našteti je bilo 377 enot plena, pripadajočih 59 taksonom. Med nevretenčarji je bilo največ žuželk Insecta – 94,72 %. Identificirani so bili tudi pajki Aranea – 3,4 %, suhe južine Opiliones – 0,80 %, maloščetinci Lumbricomorpha, polži Gastropoda in stonoge Juliformia – s po 0,27 %. Vretenčarji – poljska voluharica *Microtus arvalis* – so sestavljali 0,27 % celotnega plena. Najbolj raznolik del plena so sestavljali hrošči Coleoptera – 41,11 % vseh enot plena: ugotovljenih je bilo kar 11 družin. Skoraj polovico hroščev (48 %) sta zastopali vrsti iz družin Scarabaeidae in Carabidae. V primerjavi z odraslimi srakoperji je prehrana gnezdomcev vsebovala predvsem mehke, neotrdel plen: Aranea (6,8 proti 3,6 %), Lepidoptera caterpillars (5,8 in 1,8 %), Opiliones (1,9 in 0,0 %) in Lumbricomorpha

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(1,0 in 0,0 %). Kar zadeva prehrano odraslih srakoperjev, so rezultati lahko podcenjeni; v ostankih iz izbljuvkov je težko identificirati omenjene organizme. Nekateri taksoni – Opiliones, Juliformia, Lumbricomorpha in presenetljivo glodalci Rodentia – so bili najdeni le v prehrani mladičev, medtem ko so bili ostanki polžev ugotovljeni samo v prehrani odraslih srakoperjev.

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