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Diet composition and prey choice by the red-backed shrike *Lanius collurio* in western Poland

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ABSTRACT. We investigated diet and prey choice in a population of red-backed shrike (*Lanius collurio*) living in an intensively used farmland (W Poland). Diet was estimated by three methods : collars in nestlings, and pellets and prey remains in larders. Insects, mainly Coleoptera, Hymenoptera and Orthoptera constituted 97.7% of the diet, with a total of 4392 prey items identified from all samples. However, during rainy and cold days vertebrates formed an important component (up to 26.5% by biomass) of the food of the red-backed shrike.

Food preference – expressed in relation to availability – was estimated for five arthropod taxa. Hymentoptera, Orthoptera and Coleoptera were more preferred prey. Heteroptera and "other invertebrates", included mainly flies, dragonflies and spiders were less preferred.

For rational management of the red-backed shrike in farmland, we suggest that places with available prey (in appropriate densities), small vegetation patches and perches suited to low-expenditure hunting strategy, should be preserved, as well as established.

KEY WORDS : diet, food selection, insects, vertebrates, *Lanius collurio.*

INTRODUCTION

The red-backed shrike *Lanius collurio* (Linnaeus, 1758) is the most numerous of the shrike species to breed in the Western Palaearctic. However, decline of the local populations over many areas within the geographical range of the species has been primarily attributed to a loss of suitable habitat. Changes in agricultural practices were thought to be partly responsible for a reduction of breeding and foraging habitats in farmland (LEFRANC, 1997; LEUGGER-EGGIMANN, 1997). Moreover, some authors showed by modelling that potential food sources have a critical role in changes in local population size of the red-backed shrikes (LEUGGER-EGGIMANN, 1997; SCHIFFERLI et al., 1999; KUPER et al., 2000) and consequently used this knowledge in conservation programs for this declining and endangered species.

The red-backed shrike is mainly an insectivorous bird; sometimes the diet is supplemented by vertebrates (LEFRANC & WORFOLK, 1997). However, data on prey preferences is still lacking, except from one study in Spain (HERNANDEZ et al., 1993). Moreover, data on the contribution of vertebrates to the diet of red-backed shrike are speculative, as studies focused on vertebrate use only, not within the context of the entire diet spectrum (KNYSH, 1982; HERNANDEZ, 1995).

Therefore, in this study we focused on (1) describing diet composition of the red-backed shrike in a farmland area, paying particular attention to the use of vertebrate prey and (2) prey selection.

MATERIAL AND METHODS

Study area and birds

The research was carried out during the period from July 1999 to August 2000 in the central Wielkopolska Province, western Poland, which is situated near town of Poznañ. The region is dominated by agricultural lands, and habitats include cultivated fields (80%), small forests (15%), marshlands (3%) and inhabited areas. Most red-backed shrikes arrive in the Wielkopolska region in early May (TRYJANOWSKI & SPARKS, 2001), start breeding between mid May and mid June (KUŹNIAK, 1999; TRYJANOWSKI et al., 2000), and leave the study area in September or October. The study area was ca 60 km^2, with a mean density of 1.1 – 1.4 breeding pairs/km^2. For further details on the study area and the biology of the red-backed shrike see KUŹNIAK & TRYJANOWSKI (2000) and TRYJANOWSKI et al. (2000).

Food analyses

Three methods were applied simultaneously to analyse diet composition and to predict prey choice (TRYJANOWSKI et al., 2003).

Food of nestlings was assessed by collar samples when the young were 5 to 10 days old. After every two to three feeding visits by the parents, the food was removed from the nestlings' throats with forceps. A total of 66 prey items were collected from 12 nests. Arthropods were preserved in ethanol (70%) and identified to the family level, using a reference collection obtained from the same study area (J. KARG, unpublished data).

Pellets were collected from 17 shrike territories. A total of 3832 prey items were identified (at least to family level) in 336 pellets. Pellets were analysed by a standard procedure (ROSENBERG & COOPER, 1990).

We also monitored larders and butchering points, where the shrikes prepare food for nestlings, as well as for themselves (LEFRANC & WORFOLK, 1997). We used data from 14 such points, with a total of 594 prey items removed from larders.

Available food

Because the red-backed shrikes prey mainly on invertebrates (for details see Results), only data for invertebrate prey were collected. A modified quick-trap method was used (RYSZKOWSKI & KARG, 1977). Samples were taken by covering 0.25 m^2 of the ground with a cage without a bottom (so called biocenometer). In six territories of red-backed shrike with places of higher shrike foraging activity, samples (10 in each control) were taken five times over the period June – August. Insects and spiders were collected from under the net by a vacuum sampler.

Data are presented as means for the whole study area during the breeding period, and are expressed as the number of individuals and/or biomass per m^2.

Calculations and statistics

Dry mass of invertebrates (after RYSZKOWSKI & KARG, 1977) was used for this analysis.

Prey choice analyses were carried out using compositional analysis of the five numerically dominant taxa : beetles (Coleoptera), bees and wasps (Hymenoptera), orthopterans (Orthoptera), bugs (Heteroptera), and a category containing all the remaining taxa referred to as "others" (moths and butterflies Lepidoptera, flies Diptera, spiders Araneae and many others – for details see Results).

To assess shrike selection of particular groups (orders) of insects, Ivlev's selectivity index (D) was calculated, as modified by JACOBS (1974) : $D = (r-p)/(r+p-2rp)$, where r denotes the fraction of a given group of insects in the total number of insects identified from pellets, and p – the fraction of a group of insects in the insect community. D varies from –1 (negative selection) to 0 (catching proportional to abundance), to 1 (positive selection).

The analysis of prey choice was done in six territories only, where data on the red-backed shrike diet were collected using all three methods and the information on density of prey was available.

Because data on vertebrates in the red-backed shrike diet were limited, we decided to enlarge the study plot to include habitats located around it. Success of vertebrate catching was investigated using χ^2 - test, with two daily groups : with and without rain. Daily precipitation data for the study period were obtained from the Turew local meteorological station, located in the centre of the study area.

Standard statistical methods were used according to ZAR (1999). All statistical tests were two-tailed.

RESULTS

Invertebrates

Invertebrates constituted 98.9% of all (N = 4392) prey items, but 73.5% of dry mass from 415 g biomass consumed (Table in appendix). In general, the two methods of assessment of food contents, by number of individual prey items and by biomass, were highly positively correlated ($r_s = 0.752$, n = 150 prey categories, $p < 0.0001$).

Over 51% of the prey items were beetles; dung (Scarabeidae) and ground (Carabidae) beetles accounted for almost a third of the prey. Hymenoptera, with ants (Formicidae), ichneumon flies (Ichneumonidae), bees (Apidae) and wasps (Vespidae), made up around 22% of the diet. A third and a fourth group were grasshoppers and crickets (Orthoptera : Tettigonidae and Acridiidae) and bugs (Heteroptera), representing respectively 12.9 and 7.2% of the diet. The group labelled "others" invertebrates and vertebrates accounted together for only approximately 7%. Pattern of prey use by biomass is similar, although with more important roles for orthopterans and vertebrates (Fig. 1 A & B).

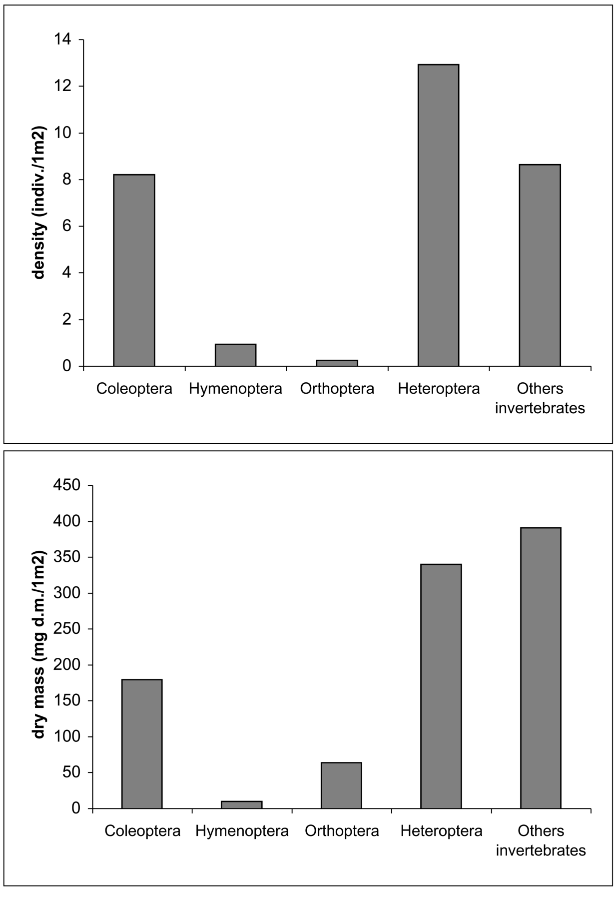

Fig. 1. – Percent composition of the red-backed shrike diet in terms of number of prey (A-top) and biomass (B-bottom).

Vertebrates

A total of 64 vertebrate prey caught by the red-backed shrike were recorded (Table 1). Small mammals constituted the main prey item (over 80%). Vertebrates were more often predated on cold and rainy days, than on days without rain ($p < 0.0001$).

TABLE 1

Vertebrates in the diet of the red-backed shrike in Wielkopolska Province, Poland. All methods complied.

Prey item	N individuals	%
Microtus sp.	29	45.3
Apodemus sp.	11	17.2
Mus musculus	1	1.6
Sorex sp.	11	17.2
Micromammalia total	*52*	*81.3*
Emberiza citrinella	4	6.3
Parus caeruleus	1	1.6
Passeriformes indet.	1	1.6
Aves total	*6*	*9.4*
Lacerta sp.	3	4.7
Rana sp.	3	4.7
Vertebrates total	64	100

Prey choice

The main potential food consisted of bugs (Heteroptera), by number of individuals, and other invertebrates (this category included mainly flies and dragonflies) by biomass (Fig. 2 A & B).

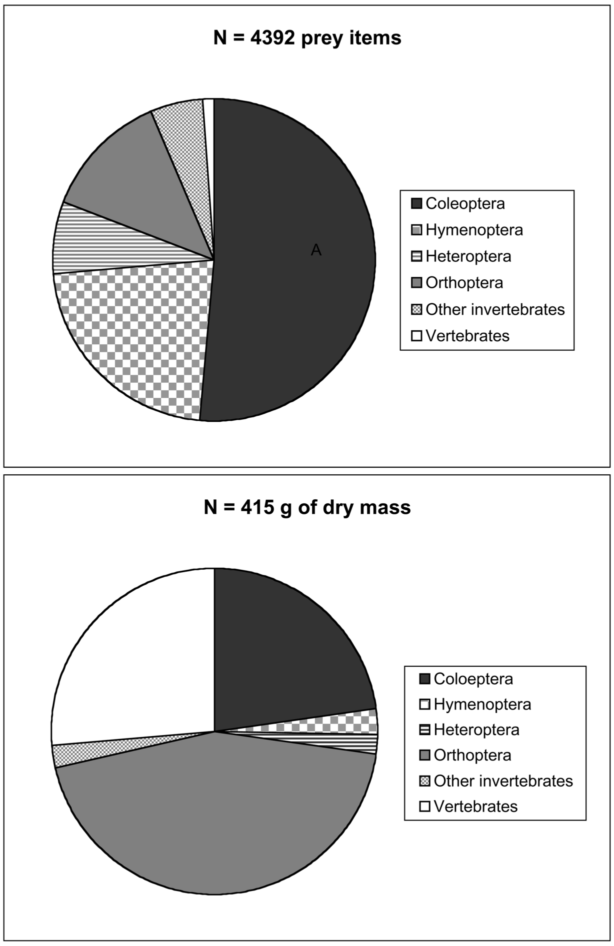

Fig. 2. – Density (top) and biomass (bottom) of potential invertebrate prey in territories of the red-backed shrike in Wielkopolska Province.

The red-backed shrike actual prey spectrum is significantly different from the potential one, both in terms of density of potential food ($p < 0.001$) and its biomass ($p < 0.001$). Out of five invertebrate taxa, Coleoptera, Hymenoptera and Orthoptera occurred in the content of red-backed shrike food more often than expected from sampling ("preferred food"), whereas Heteroptera and the category "other invertebrates" occurred less often ("avoided food"), both by numbers and by biomass (Table 2).

TABLE 2

The proportion of invertebrate groups in shrike territories and the proportion of prey selected by the red-backed shrikes in Wielkopolska Province, Poland. Explanations : PD – potential prey by density, PB – potential prey by biomass, SN – proportion among prey items in the red-backed shrike diet by number of specimens, SB – proportion of biomass given prey consumed. Index DD and Index DB - Ivlev's selectivity index for numbering and biomass, respectively.

Prey items	PD	SN	Index DD	PB	SB	Index DB
Coleoptera	0.265	0.615	0.632	0.182	0.420	0.530
Hymenoptera	0.030	0.218	0.799	0.010	0.073	0.775
Orthoptera	0.008	0.044	0.700	0.065	0.369	0.786
Heteroptera	0.418	0.077	-0.792	0.346	0.072	-0.744
Other invertebrates	0.279	0.046	-0.778	0.398	0.066	-0.807

DISCUSSION

Diet composition

The composition of the red-backed shrike diet is influenced by many external factors including habitat and territory quality, geographical location, weather conditions, time of day or season, as well as even by methods of food content analyses (Cramp & Perrins, 1993; Hernandez et al., 1993; Leugger-Eggimann, 1997; Tryjanowski et al., 2003).

The food composition of the red-backed shrike in Wielkopolska appears to be typical for its entire European range (review in : Cramp & Perrins, 1993). Especially large species of Coleoptera (Carabidae, Scarabeidae, Silphidae), Hymenoptera (*Apis*, *Vespa*, *Vespula*) and Orthoptera (*Tettigonia*) constituted a major part of the diet. Large species of beetles and orthopterans were found as the main red-backed shrike food in some areas (Randik, 1970; Cramp & Perrin,s 1993; Nikolov, 2002). These prey can also be potential shrike population density regulators (Kuper et al., 2000). Moreover, it is possible to improve the quality of breeding territories by establishing special habitat patches for these insects (Van Nieuwenhuyse et al., 1999; Kuper et al., 2000). Both beetles and grasshoppers, are captured by relatively energetically non-expensive methods, known as the sit-and-wait strategy (Lefranc & Worfolk, 1997, Van Nieuwenhuyse et al., 1999). Our findings showed the red-backed shrike is ecologically flexible in using new food sources. For example, in the study area the cereal ground beetle *Zabrus tenebrioides* forms an important part of the red-backed shrike diet. Imago of the cereal ground beetles live on the ears of the cereals. On many occasions the red-backed shrikes were observed hovering over ears of the cereal crops, especially during plagues of these beetles in 2000, when density was up to 2 indiv. / 1m^2 (and biomass up to 175 mg / 1m^2; J. Karg, unpublished data). The shadow of birds causes beetles to roll off the plants as an antipredation reaction. They were then easily taken from the ground by the red-backed shrike.

As expected, the percentage of Hymenoptera in the diet (both by number and biomass) is high. However, as catching of bees and wasps is energetically costly (LEUGGER-EGGIMANN, 1997), these groups are probably less important for shrikes.

It is well known that vertebrates supplement the diet (LEFRANC & WORFOLK, 1997) and are represented by different taxa, ie. small passerines, small mammals, lizards, frogs and even fish (KNYSH, 1982; HERNANDEZ, 1995). So far only MANSFELD (1958) tried to explain why red-backed shrike seldom caught vertebrates. He suggested that it depends on vertebrate availability. For example, during rich vole years they constituted up to 12% of prey items (and up to 87% by biomass). In many other studies, however, both during rich- and poor-vole years, vertebrates constituted only small percentages of the prey (e.g. LEFRANC & WORFOLK, 1997). We support the theory that red-backed shrike catch vertebrates so infrequently because attacking and handling time for this prey are energetically expensive (HERNANDEZ et al., 1993) while preying upon invertebrate appears to be a much less expensive hunting strategy. During cold and rainy weather, when insect activity is much reduced, red-backed shrikes are forced to prey on vertebrates.

Prey preferences

Habitat selection in birds follows a sequential hierarchy (CODY 1985). While studying food preference within territories, we should remember that a previous step was territory site choosing. However, in this process the red-backed shrike can use information related to potential food sources and their availability (e.g. height of plant cover, number of perches, vegetation structure), and availability of safe nesting sites (KUŹNIAK & TRYJANOWSKI, 2000). The structure of potential food in the red-backed shrike territories is similar to the insect community in the whole farmland (KARG & RYSZKOWSKI, 1996). It is linked with insect richness in margin habitats (small woodlots, hedgerows, ecotones, small open patches with xerophilic plants) and meadows, both preferred by breeding red-backed shrikes (KUŹNIAK & TRYJANOWSKI, 2000).

Coleoptera, Hymenoptera and Orthoptera comprised preferred food of the red-backed shrike in the study area. In general, beetles were preferred, although these insects comprise a large and diverse group. It is well known that red-backed shrike prefer mostly large species (CRAMP & PERRINS, 1993; LEFRANC & WORFOLK, 1997), although they prey also upon small ones. Furthermore, among beetles we found species that secrete an odour, known as antipredator strategy (genus : *Silpha*, *Necrophorus*). Similarly, MIELEWCZYK (1976) found some individuals of the Colorado beetle *Leptinotarsa decemlineata* in the red-backed shrike diet. Other preferred groups, which use special antipredator strategies, were bees and wasps (Hymenoptera). The red-backed shrike efficiently caught these insects. Moreover, contrary to the suggestion by GWINNER (1961), bees sometimes are eaten, with their stings (often recorded in pellets).

In agreement with predictions (cf. VAN NIEUWENHEUSE et al., 1999; KUPER at al., 2000) we found that Orthoptera species were also an important part of the diet. On the other hand, in Spain, HERNANDEZ et al. (1993) indicated that grasshoppers and crickets are rather avoided, most probably due to local conditions.

Recommendations for management

Detailed knowledge of the food consumed may assist management programs for the red-backed shrike (SCHFFERLI et al., 1999; KUPER et al., 2000). We conclude that the red-backed shrike is very flexible in its use of different food spectra. Therefore, not only the food source in an agricultural landscape is a potential regulatory factor for the red-backed shrike population, but also prey accessibility. To improve red-backed shrike foraging success, places with short vegetation and additional perches should to be prepared (VAN NIEUWENHUYSE et al., 1999). However, only management actions that focus on nest safety as well as foraging success can assist the red-backed shrike populations in modern farmland regions (LEFRANC, 1997; LEUGGER-EGGIMANN, 1997; SCHIFFERLI et al., 1999).

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APPENDIX

Diet composition of the red-backed shrike during the breeding season in Wielkopolska Province, Poland. N denotes number of prey items (in number of individuals), whereas Prey is ratio of the total prey number, Bio is ratio of biomass (in mg of dry mass) consumed.

Prey item	N	Prey	Biomass	Bio
Coleoptera	2261	0.515	95072	0.229
Carabidae	1091	0.248	72323	0.174
Carabus violaceus	4	0.001	535	0.001
Carabus cancelatus	1	0.000	126	0.000
Carabus sp.	69	0.016	9225	0.022
Carabidae indet.	5	0.001	118	0.000
Broscus cephalotes	1	0.000	54	0.000
Bembidion sp.	70	0.016	82	0.000
Agonum sp.	5	0.001	42	0.000
Lebia sp.	1	0.000	26	0.000
Calosoma sp.	49	0.011	12332	0.030
Amara sp.	89	0.020	756	0.002
Calathus sp.	95	0.022	1617	0.004
Harpalus sp.	2	0.000	52	0.000
Idiochroma sp.	1	0.000	5	0.000
Ophonus sp.	14	0.003	119	0.000
Pterostichus sp.	397	0.090	21512	0.052
Pterostichus cupreus	1	0.000	54	0.000
Zabrus tenebrioides	287	0.065	25666	0.062
Scarabaeidae	719	0.164	7485	0.018
Anomala dubia	571	0.130	3023	0.007
Anomala aenea	1	0.000	42	0.000
Aphodius fimetarius	16	0.004	143	0.000
Aphodius rufus	1	0.000	9	0.000
Aphodius fossor	1	0.000	9	0.000
Aphodius sp.	15	0.003	101	0.000
Rhizotroous sp.	7	0.002	556	0.001
Onthophagus sp.	5	0.001	48	0.000
Valgus hemipterus	1	0.000	21	0.000
Geotrupes stercorosus	1	0.000	92	0.000
Geotrupes sp.	23	0.005	2105	0.005
Phyllopertha horticola	77	0.018	1336	0.003
Curculionidae	159	0.036	1083	0.003
Phyllobius sp.	82	0.019	300	0.001
Cleonus sp.	1	0.000	1	0.000
Otiorrhynchus sp.	16	0.004	596	0.001
Sitona sp.	17	0.004	79	0.000
Curculionidae indet.	43	0.010	107	0.000

Prey item	N	Prey	Biomass	Bio
Elateridae	59	0.013	810	0.002
Selatosomus aeneus	5	0.001	176	0.000
Agriotes sp.	27	0.006	261	0.001
Elateridae indet.	27	0.006	373	0.001
Staphylinidae	84	0.019	483	0.001
Lathrobium sp.	1	0.000	2	0.000
Ontholestes sp.	14	0.003	226	0.001
Philonthus sp.	46	0.010	66	0.000
Staphylinus sp.	5	0.001	164	0.000
Heterothops sp.	4	0.001	1	0.000
Staphylinidae indet.	14	0.003	25	0.000
Silphidae	63	0.014	10752	0.026
Nicrophorus sp.	32	0.007	8507	0.020
Silpha sinuata	1	0.000	26	0.000
Silpha sp.	18	0.004	468	0.001
Silphidae indet.	12	0.003	1751	0.004
Chrysomelidae	17	0.004	176	0.000
Lema sp.	3	0.001	9	0.000
Leptinotarsa decemlineata	1	0.000	74	0.000
Chrysomelidae indet.	13	0.003	93	0.000
Histeridae	12	0.003	84	0.000
Hister sp.	12	0.003	84	0.000
Cerambycidae	10	0.002	479	0.001
Spondylis buprestoides	2	0.000	17	0.000
Saperda sp.	1	0.000	58	0.000
Cerambycidae indet.	7	0.002	404	0.001
Leiodidae	3	0.001	0	0.000
Anisotoma humeralis	3	0.001	0	0.000
Cicindellidae	2	0.000	17	0.000
Cicindela sp.	1	0.000	8	0.000
Cicindela campestris	1	0.000	8	0.000
Lagriidae	3	0.001	112	0.000
Lagria hirta	3	0.001	112	0.000
Nitidulidae	4	0.001	2	0.000
Meligethes sp.	4	0.001	1	0.000
Others Coleoptera	37	0.008	1266	0.003

Prey item	N	Prey	Biomass	Bio
Hymenoptera	971	0.221	9872	0.024
Formicidae	291	0.066	258	0.001
Formica rufa	56	0.013	66	0.000
Lasius niger	145	0.033	91	0.000
Lasius sp.	7	0.002	4	0.000
Formica sp.	83	0.019	95	0.000
Ichneumonidae	328	0.075	992	0.002
Ophion sp.	31	0.007	247	0.001
Ophion luteus	3	0.001	24	0.000
Cryptinae	24	0.005	59	0.000
Ichneumonidae indet.	270	0.061	662	0.002
Apidae	157	0.036	3933	0.009
Apis mellifera	66	0.015	1416	0.003
Apis sp.	5	0.001	107	0.000
Andrena sp.	13	0.003	114	0.000
Bombus sp.	28	0.006	1420	0.003
Nomada sp.	1	0.000	4	0.000
Apidae indet.	44	0.010	872	0.002
Vespidae	153	0.035	3937	0.009
Vespula rufa	20	0.005	515	0.001
Vespula vulgaris	2	0.000	51	0.000
Vespula germanica	41	0.009	1055	0.003
Vespula sp.	75	0.017	1930	0.005
Vespa crabro	5	0.001	129	0.000
Vespa sp.	8	0.002	643	0.002
Dolichovespula norvegica	1	0.000	26	0.000
Dolichovespula sylvestris	6	0.001	154	0.000
Vespidae indet.	2	0.000	51	0.000
Myrmicidae	19	0.004	22	0.000
Myrmica sp.	19	0.004	22	0.000
Eumenidae	9	0.002	44	0.000
Sphecidae	3	0.001	50	0.000
Ammophila sabulosa	2	0.000	43	0.000
Sphecidae indet.	1	0.000	7	0.000
Mutillidae	1	0.000	2	0.000
Aryidae	1	0.000	2	0.000
Tenthredinidae	1	0.000	10	0.000
Chrysididae	1	0.000	3	0.000
Heteroptera	317	0.072	7823	0.019
Pentatomidae	286	0.065	7661	0.018
Palomena prasina	30	0.007	697	0.002
Palomena sp.	3	0.001	70	0.000
Pentatoma sp.	3	0.001	98	0.000
Picromerus bidens	2	0.000	65	0.000
Eurygaster maura	53	0.012	1922	0.005
Eurygaster sp.	6	0.001	218	0.001
Eurydema oleracea	2	0.000	16	0.000
Dolycoris sp.	7	0.002	81	0.000
Aelia acuminata	14	0.003	200	0.000
Aelia sp.	4	0.001	57	0.000
Pentatomidae indet.	162	0.037	4237	0.010
Lygaeidae	3	0.001	4	0.000
Acanthosomidae	2	0.000	16	0.000
Miridae	5	0.001	11	0.000
Notostira sp.	2	0.000	5	0.000
Lygus sp.	3	0.001	6	0.000
Coreidae	3	0.001	96	0.000
Coreus sp.	2	0.000	74	0.000
Coreidae indet.	1	0.000	22	0.000
Nabidae	16	0.004	32	0.000
Nabis ferus	3	0.001	6	0.000
Nabis sp.	13	0.003	26	0.000
Tingidae	1	0.000	0	0.000
Tingis sp.	1	0.000	0	0.000
Berytidae	1	0.000	1	0.000
Berytinus sp.	1	0.000	1	0.000
Orthoptera	568	0.129	183206	0.441
Tettigonidae	455	0.104	178211	0.429
Tettigonia sp.	434	0.099	177940	0.429
Metrioptera roselli	1	0.000	119	0.000
Tettigonidae indet.	10	0.002	152	0.000
Acridiidae	122	0.028	4955	0.012
Chorthippus sp.	30	0.007	1218	0.003
Acridiidae indet.	92	0.021	3736	0.009
Orthoptera indet.	1	0.000	41	0.000
Dermaptera	25	0.006	293	0.001
Forficulidae	25	0.006	293	0.001
Forficula auricularia	12	0.003	141	0.000
Chelidurella acanthopygia	1	0.000	12	0.000
Forficula sp.	2	0.000	23	0.000
Forficulidae indet.	10	0.002	117	0.000
Blattodea	1	0.000	2	0.000
Blattidae	1	0.000	2	0.000
Ectobius sp.	1	0.000	2	0.000
Odonata	10	0.002	5535	0.013
Diptera	87	0.020	805	0.002
Sarcophagidae	19	0.004	269	0.001
Calliphoridae	21	0.005	297	0.001
Lucilia sp.	1	0.000	14	0.000
Calliphoridae indet.	20	0.005	283	0.001
Tachinidae	12	0.003	286	0.001
Tachina sp.	1	0.000	3	0.000
Tachinidae indet.	8	0.002	27	0.000
Muscidae	2	0.000	12	0.000
Bibionidae	10	0.002	13	0.000
Asillidae	4	0.001	56	0.000
Diptera indet.	22	0.005	128	0.000
Lepidoptera	39	0.009	335	0.001
Noctuidae	3	0.001	24	0.000
Agrotis sp.	3	0.001	24	0.000
Lepidoptera larvae indet.	34	0.008	305	0.001
Lepidoptera indet.	2	0.000	5	0.000
Neuroptera	2	0.000	6	0.000
Myrmeleontidae	1	0.000	3	0.000
Myrmeleon sp.	1	0.000	3	0.000
Chrysopidae	1	0.000	3	0.000
Homoptera	4	0.001	14	0.000
Cercopidae	3	0.001	13	0.000
Philaenus sp.	3	0.001	13	0.000
Iassidae	1	0.000	1	0.000
Aphrodes sp.	1	0.000	1	0.000
Diplopoda	27	0.006	1804	0.004
Isopoda	9	0.002	192	0.000
Araneae	5	0.001	14	0.000
Opiliones	2	0.000	5	0.000
Molusca	12	0.003	6	0.000
Invertebrates total	**4343**	**0.989**	**304998**	**0.735**
Aves	3	0.001	18000	0.043
Mammalia	46	0.010	12000	0.029
Vertebrates total	**49**	**0.011**	**110000**	**0.265**

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